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THE

LONDON PRICES

OF

Bricklayers *Materials* and *Works*,

BOTH

Of NEW BUILDINGS and REPAIRS,

Justly Ascertained:

AND

The Common Exactions and Abuses therein Detected.

Interspersed with RULES for *Estimating*, *Performing* and *Measuring* all Kinds of

PLAIN, CIRCULAR, ELLIPTICAL, GOTHICK, SPHERICAL, SPHEROIDICAL, CONICAL and PYRAMIDICAL BRICK-WORKS:

WHEREIN

The ABUTMENTS of all Sorts of Arches,

And the Manner of

Building *Brick-Flooring* for the Prevention of FIRE, is clearly explained.

The Whole *Arithmetically* and *Geometrically* DEMONSTRATED.

Also Illustrated with a great Variety of *Designs* for

Plain and *Rusticated* PIERS, for Gates, Piazzas, &c.

In Thirty-two curious Copper Plates.

WRITTEN for the Use of

GENTLEMEN, STEWARDS, and WORKMEN in general, and particularly for such LANDLORDS and TENANTS who are subject to the Repairs of Buildings.

By BATTY LANGLEY, *Architect*.

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INTRODUCTION.

AS this Work is designed for to *ascertain* HONEST *Prices* for *Materials* and *Workmanship* in all the several Businesses of Building, in order to prevent *Contests at Law*, *Disputes*, &c. between *Gentlemen* and *Workmen*, without the least Injury to either Party; therefore none can object against it, but such whom it may, and indeed, will *affect*; *namely*, Those who live chiefly by *Frauds and Exactions*.

BY FRAUDS, I mean, FIRST, such Practices, as not performing Works in so good a Manner as is undertaken and agreed to be done, and is paid for; and, SECONDLY, *the charging of Gentlemen, with much greater Quantities of Materials and Workmanship, at very high Rates, which never were delivered, and performed*; and which is always done, and indeed can't be avoided, by every Person who is so base and injurious to the FAIR TRADER, as for to undertake to serve in

Materials, and perform Works *for leſs Money than they muſt actually pay for them, out of their own Pockets.*

THIS *baſe Practice*, for no leſs can I call it, is at this Time practiced by many Tradeſmen of Repute, under the Face of working cheap, when at the ſame time, and eſpecially in all future Works, after they have ſo initiated themſelves, they are conſtantly *picking thoſe Gentlemen's Pockets*, and that very largely too, as will, in the Courſe of this Work, be clearly proved.

BY *Exactions* in the Prices of *Materials* and *Workmanſhip*, I mean, Exceſſes more than their real Value.

BY the *real Value of Materials*, I don't mean the moſt Money that they may be ſold for at any Time after having been uſed, or employed; but I mean ſuch an Advance, or Increaſe of Price, above their Prime Coſts, which is reaſonable, that every Maſter ſhould be paid, for the Intereſt of his Monies laid out; for his Wareh0uſe-Room, *&c.* and for his Time, Expences, and Trouble to buy in, attend Gentlemen, *&c.* which when ſold in ſmall Quantities for Repairs, as likewiſe for Day-Workmen's Labour, is honeſtly worth 25 *per Cent.* But for Materials ſold in large Quantities for new Works, *Twelve and a Half per Cent.* is a ſufficient HONEST GAIN, provided that Workmen are ſo paid, in Proportion to the Quantity of Works done,

done, at all Times when required; and which every Gentleman, who employs Builders, ought to do for his own Sake: Because, then the Master is enabled, not only to purchase and lay in Materials, at the best Hand; *but to buy the best of Materials, for less Money, than he must pay the Timber-Merchant, &c. for the very worst, when he buys on Credit.*

IT is very reasonable to believe, that long Credit, *exacted* by some Gentlemen from Tradesmen, was the original of Exactions in Trade; because, when Tradesmen sold their Goods with Expectancy of being obliged to give *long Credit*; they were under a Necessity of rating them at such excessive high Rates, as they were sure would be an Adequate to the Length of Credit to be given, which no HONEST *Trader* would have done, or will do now, would but every Gentleman pay his Debts as the WORTHY and HONOURABLE *never fail to do*, when desired.

AND indeed was such Exactions in the Prices of Goods, *&c.* to extend to no other Gentlemen, but such who are long-winded; it would not be unreasonable; provided the Excess was not too great: But now, without Distinction, all Persons by many Traders are treated alike. *The worthy* HONEST GENTLEMAN, *who takes Pleasure in paying his Tradesmen their* HONEST DUES *when desired*, is made to pay the same extravagant Prices, as *he who exacts long Credit for Years*; which

is as abusive in such Tredesmen; as long Credit taken at Pleasnre by such Gentlemen *who know their Persons to be inviolable*, is dishonourable and destructive to Trade.

In short, as *long Credit is the Bane of Trade*, and *Ruin of Families*; and as Exactions in Trade without Respect to Persons, is very hurtful to the Public, it is therefore heartily wished that some Expedient may be found, which will totally suppress those oppressive Practices, *which are hateful to God, and all worthy Men.*

To prescribe Laws for their Annihilation, would be a Presumption unpardonable, and a Work beyond my Capacity; but I humbly conceive, that if the LEGISLATURE *in their great Wisdom*, would abolish the Laws of *Privileges*, by Virtue of which, very great Lengths of Credit are taken by many; and to which I am confident every HONEST GENTLEMAN will not refuse to subscribe; it would be a great (if not the only) Means, for to totally suppress those Abuses for the future.

BUT as to establish so glorious a Law, may be a Work of Time, I must therefore beg Leave to observe, in the Interim, as Debt lyeth against every Gentleman for Materials, Works and Labours, as soon as they are delivered and done, that therefore Workmen have the same RIGHT to be paid lawful Interest for their Monies so due to them, from such Time, or at least from the Time of the

Delivery

Delivery of their Bills; the very ſame, as if at the ſame Time, they had actually lent Sums of ready Money out of their Pockets, equal to the Sums fairly due to them for their Materials ſold and delivered, and for their Works and Labours done; becauſe, when a Workman is ſo paid at the Delivery of his Bill; he is thereby enabled to go to Market again, and in his Courſe of Trade and Buſineſs, can make a much greater Advantage of his Money, than the lawful Intereſt thereof would amount to.

IF Workmen were to be ſo paid, on their Delivery of HONEST BILLS, all of them would flouriſh, and become uſeful to their Country, inſtead of many of them, by giving long Credit, are ruined, and burthenſome to their Pariſhes. For when Workmen make HONEST BILLS for their Materials and Labours, and are kept out of their Monies for a long Time without any Conſideration for it, and are thereby (for to pay their Journeymen, and maintain their Families) *compelled to borrow Money of Uſurers at very high Intereſt*, and very often much higher than their Profits in Trade and Buſineſs amount to; they cannot avoid very great Loſſes, if not irretrieveable Ruin.

NOW, as I have given theſe few Hints of the ill Conſequences of *exacting long Credit*; and as the Deſign of this Work, is *to prevent Frauds and Exactions for the future*, by Workmen,

Workmen, by exposing those Abuses to publick View; it is therefore hoped, that no Workman, for the future, will attempt exorbitant Gain, and that every GENTLEMAN will HONOURABLY DETEST *long Credit*.

AND in order to prevent *Frauds and Exactions* in the *Quantities* and *Prices* of *Materials*, and *Abuses in the Performances of Works*, in all the several Businesses of a BRICKLAYER, CARPENTER, *&c.* I have not only shewn the *Kinds*, *Dimensions*, and *Quantities* of every Kind of Material required for the Performance of every Sort and Kind of Work (be it great or small) with *Arithmetical* RULES for to compute them, with very great Accuracy; but also how, by knowing their Prime Costs, *to ascertain their Retail Prices*, with HONEST GAIN. in all Parts of the Kingdom; and consequently to discover and detect Frauds and Exactions, when they may be attempted.

AND with Regard to the *Prices of all Kinds of Workmanship*; those, I have *ascertained from my own Experience* of twenty Years past, at honest Rates; *that is, I have ascertained, what Quantity of every Kind of Work, singly, in every particular Branch and Trade, that many tolerable good and honest Workmen, have each always done, and always do* per *Day*, from Six in the Morning to Six in the Evening, including the usual Times for Breakfast, Dinner,

Dinner, and Refreshment in an Afternoon, without Hurry or hard Labour.

AND THEREFORE, *if any Quantity of Work done, or to be done, be divided by such Quantity thereof, which a Workman can perform in a Day as aforesaid; the Quotient will be the Number of Days required for to perform the whole Work*, which Number of Days, being rated at the customary Price of the Country, will give the total Prime Cost of Workmanship.

BUT methinks I hear some object hereto, and say, That Country Workmen are slow, and don't perform Works with that Expedition as our *London* Workmen do, and therefore there cannot be a fixed Quantity of Work ascertained, for a Country Workman to perform in a Day. To this I answer, That Country Workmen can, if they will, do as much Work *per* Day as our *London* Workmen. For our best *London* Workmen are chiefly Country Men; who have no more Hands than two, each Man; as every of those in the Country have: And therefore, if by an idle Habit of Body, they will not move, and work with the same Celerity and Agility of Body, as *London* Workmen do, let them starve in their obstinate Sloth.

NOW, if to the total of the Prime Costs of Materials and of Workmanship, be added a 5th Part thereof (which is 25 *per Cent.* Profit) the Sum will be the HONEST *Value* of the

the whole, when for REPAIRS: But when the Work is a new Erection; then to the Total of the Prime Costs of the Materials, add an 8th Part thereof (which is 12 and a Half *per Cent.* Profit thereon) and to the Total of the the Prime Cost of Workmanship, add a 4th Part (as before) and then the Sum of these Totals, and Additions, will be the honest Value, which the Workman is to be paid for his Materials and Labour. But when Gentlemen find, or buy in their own Materials, which in most Countries is commonly done, then to the Prime Cost of Workmanship add a 4th Part thereof (which is 25 *per Cent.* Profit as aforesaid) and the Sum will be its just Value, which the Master-Workman ought to be paid.

FROM a just Knowledge of the *Prime Costs of Materials and Labour* in Workmanship, GENTLEMEN are not only taught to know how to distinguish HONEST WORKMEN from *Impostors,* who frequently will undertake Works for *less than Prime Cost,* as I have already observed: But 'tis of great Use even to Master-Workmen themselves in many Cases, and especially to young Beginners, who will thereby be enabled not only to avoid inadvertent Impositions on Gentlemen, by asking at a venture too much; but even on themselves, when, for want of being thoroughly acquainted therein, they may ask too little, and contract (as many have done) for the Performance

Performance of *Works* at leſs Prices, than their Prime Coſts have amounted too, and thereby injure (if not ruin) themſelves and their Families.

AND with Regard to the Performance and Goodneſs of Workmanſhip being made known; I am confident that able Workmen, will make no Objections to it, becauſe they regard not who inſpect their Works, and indeed had much rather, that every Gentleman for whom they do Buſineſs, was a competent Judge of their Performances, than to be not ſo; becauſe ſuch Gentlemen know when they are well uſed, and never fail to handſomely reward every Workman, for his Labour, as his Merit deſerves. Whereas many other Gentlemen, who are quite unacquainted with the Nature and Goodneſs of Works, are therefore generally ſuſpicious of being ill uſed, and unwilling to pay a good Workman, his juſt and honeſt DUES, notwithſtanding that he has done his Works, in the moſt Maſterly and Workman-like Manner.

HENCE 'tis evident, *that to keep Gentlemen in Ignorance, of the Nature, Goodneſs and Value of Materials and Workmanſhip, is injurious to good Workmen in general*; and indeed, none but *idle, poor Proficients*, to ſkreen their own Ignorance; and *deſigning, over reaching Wretches*, will attempt ſo to do.

IN the Courſe of this *laborious Work*, which none (I believe) but myſelf would

have undertaken in this *Iron-Age* (reproachful to Posterity,) when little else but *stupid Luxury*, *Vice*, and COXCOMBS are encouraged; when ARTS and ARTISTS are known to, and encouraged but by few; and when *Porters* to Persons of less Merit, are by them, authorized *impudently* to reject all Offers and Proposals, for the Encouragement of Industry, and for *the Improvement* of ARTS and SCIENCES; notwithstanding that TRADE, the very *Basis* of the *common Good*, is absolutely *founded*, and *dependant* thereon; I have Interspersed, not only a very great Number and Variety of useful and *grand Designs* for all the *Particular Parts*, and *Ornaments* of *Buildings in general*, in all the several Branches of Business; and the Manner of Proportioning them of any Magnitude required; *but I have also* to every of them, affixed the HONEST *Prices* or *Values* of their *Materials and Workmanship* separately; so that Gentlemen from thence may fit themselves with such, as may be agreeable both in Point of *Design* and *Expenee*, without Trouble.

AND that this Work may be *a compleat* SYSTEM *or* BODY *of Architecture*, after having fully explained the *Kinds*, *Dimensions* and *Prices of Materials* and *Workmanship*; as also RULES for *Designing and Performing all Kinds of Works*, &c. I have added a very great Variety of useful PLANS and ELEVATIONS, for Buildings in general, *viz.* for CITY, COUNTRY and FARM-HOUSES, from 300*l.* to

to 20,000*l.* Value, as alſo for *Pavilions, Temples*, and other Buildings of Pleaſure, for Decorating of *Gardens, Parks, &c.* in the GOTHIC and MODERN *Taſtes*; many of which, are finely deſigned by a NOBLE LORD, of *exquiſite Judgment*; by which, ſuch Gentlemen who hereafter have Occaſion to build, may not only, from the *great Choice*, fix on *Plans* agreeable to their Purpoſes; but at the ſame Time be *truely informed*, by an Eſtimate of every Particular at large, of the real Expences; and thereby *avoid*, being *drawn in*, and compelled to lay out a greater Sum of Money (as is often done by the Advice of unſkilful deſigning Workmen and Builders) than at the Firſt was propoſed or intended; and indeed ſometimes, more than may be agreeable, or can be conveniently ſpared, without doing an Injury to the Eſtates; witneſs that intended ſtupendous Building, began Years ago, at the Expence of ſome Thouſands, at *Carſhalton*, in *Surry*, under the Direction of the late Mr. *Leoni*, ſince *diſcontinued* and *dormant* in Ruin.

HAD ſuch a Work as this been extant, before that *worthy* GENTLMAN its *Owner* began it, he, by being hereby enabled to *eſtimate*, would have ſeen the great Expence he was going to plunge himſelf into, and conſequently would not have entered into it, by any Advice or Means whatſoever.

To this, I could add many other Instances to prove the Necessity of Gentlemen's understanding how to estimate and value their own Works, that thereby they may prevent being drawn into such Dilemma's, and be sure of what they are about doing.

I very well remember, that the late TRUELY NOBLE-SPIRITED DUKE of *CHANDOIS*, to whom I had the Honour of being known, assured me, that the greatest Part of his Buildings at his GRACE's Seat at *CANNONS* near *Edgware* in *Middlesex*, cost his GRACE considerably more than double the Sums proposed by his Surveyors and Workmen. And that the Offices, *&c.* to his GRACE's House in *Cavendish-square*, before they were began, was proposed by Mr. *S——p——d* to be built for 600 *l.* which, when finished, measured, and valued, amounted to 1800 *l.* and which was 1200 *l.* more than his Grace was informed of, and (as his Grace said) more than he would, at that Time, have laid out for such Purpose.

THE Motive that induces many Workmen, thus to *deceive* Gentlemen (as I have often heard many of them say) is to promote, or ause Business, for, say they, *was Gentlemen to know the Total Expence of Works before they were began, few would have Spirit sufficient to do any:* But when they don't know it, and have began, and gone on, for a considerable

considerable Way, they must then go forward and finish, if able, let the Expence and Consequence thereof, happen as they will.

And for their Justification, say they, We desire to be paid no more than real Value, which no Gentleman can deny; without consideriug or regarding, whether the real Value of the Works be, or be not, agreeable or suitable to be paid, by the Gentleman for whom they are done.

Thus much for to prove the Necessity of knowing, *how to compute Quantities of Materials and Works, and to estimate their Values*; which herein, I have fully explained, and that with great Accuracy, Justice and Conciseness.

Now, in order of proceeding to the general Work; I must, in the next Place, explain *the* Methods *and* Rules *by which all the Exactions in the several Building-Trades, are discovered.*

By *Exaction*, I mean (as I have already noted) *the Excess in Price more than real Value*, at 12 $\frac{1}{2}$, or 25 *per Cent.* Profit. That is, if I buy a Thousand of plain Tiles, &c. for 20*s.* and retail them at 30*s.* I exact 5 Shillings; because at 25 *per Cent. Profit*, which is a sufficient Gain in Trade, they are worth no more than 25 *s.*

The *Method* that I make Use of for to discover such Exactions is, by comparing the Prime

Prime Costs of Materials with their customary Retail Prices, by *the Rule of Proportion*, or Rule of Three Direct.

By *this* ANALOGY:

As the Prime Cost of any Kind of Material is to its retail Price;
So is 100, *to a fourth Number,* whose Excess (when any) above 125, is Exaction.

And so in like Manner, the Prime Cost of any Kind of Material being known, the honest retail Price, for which it ought to be sold, is allso found

By this ANALOGY:

As 100l. *Principal Money laid out, is to* 125l. *Principal Money and Profit;*
So is the Prime Cost of any Kind of Material, to the retail Price (at 25 *per Cent.* Profit) for which it ought to be sold.

And as very possible, by want of Practice, the Operation, or Manner of working the Rule of Proportion, may have slipt some Memories, I will therefore, in order for their Refreshments, beg leave to note, that it is performed by

This RULE, *viz.*

Multiply the second and third stated Numbers together, and their Product being divided by the first stated Number, the

Quotient is the fourth Number, and the Answer required.

N. B. When it is required to discover an Exaction, the Prime Cost of the Materials in Pence, Shillings or Pounds, is always the first stated Number; the Retail Price the second, and 100 is the third. But when the retail Price of any Materials at 25 *per Cent*. Profit is required, having their Prime Cost given, then 100 is always the first stated Number, 125 the second, and the Prime Cost of the Materials in Pence, Shillings, or Pounds, is the third.

EXAMPLE I.

To find how much per Cent. *Exaction does a Gentleman pay for twentypenny Nails, which Nails Workmen buy at six Shillings* per *Thousand (which is* 1200 *Nails) and Retailing them at Twentypence* per 100 *Nails, make twenty Shillings* per *Thousand.*

Now here, the *stated Numbers*, are,

First, Six Shillings the Prime Cost.
Secondly, Twenty Shillings the retail Amount. And,
Thirdly, One Huudred; *therefore*

The ANALOGY *is*,

As six Shillings the Prime Cost,
Is to twenty Shillings the retail amount;

So

So is 100, *the third stated Number,*
To 333 $\frac{1}{3}$, *a fourth Number.*

And the stated Numbers must be placed, and worked as aforesaid, *viz.*

6*s.* 20*s.* 100. 333 $\frac{1}{3}$
20

6) 2000 (333 $\frac{1}{3}$

NOW, as the fourth Number 333 $\frac{1}{3}$ doth exceed 100, by 233 $\frac{1}{3}$, so much *per Cent.* Profit, the Workman has in his Thousand of Nails; and if from 333 $\frac{1}{3}$, be subtracted 125, which is 25 *per Cent.* Profit, then the Remains is 208 $\frac{1}{3}$ *per Cent.* the Exaction required.

EXAMPLE II.

To find the honest retail Price at 25 per Cent. *Profit, of a Thousand Twentypenny Nails, whose Prime Cost is six Shillings.*

Now again, here the stated Numbers are,
First, 100*l.* Principal Money.
Secondly, 125*l.* Principal and Interest.
Thirdly, 6*s.* the Prime Cost; and, therefore,

THE ANALOGY is

As 100*l. Principal Money*
Is to 125l. *Principal and Profit,*

So

So is 6s. to 7s. 6d. *a fourth Number*, which is the Retail Price required; and the stated Numbers must be placed and worked as aforesaid, *viz.*

100*l.* : 125*l.* : : 6*s.* : 7*s.* 6*d.*

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Now if 7*s.* 6*d.* the HONEST *Retail Price* of Twentypenny Nails *per* Thousand, be subtracted from 20*s.* the usual Sum for which they are retailed, at the Rate of 20 Pence *per* Hundred, or 5 Score Nails; the Remains, 12*s.* 6*d.* is Exaction.

Thus much by Way of Introduction; now to the Purpose in Hand.

March 25,
1747.

BATTY LANGLEY.

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THE

CITY and COUNTRY COMPLETE BRICKLAYER.

CHAP. I.

Of the Kinds and Prices of BRICKLAYERS *Materials.*

THE Kinds of Materials, uſed by Bricklayers, are *Bricks*, *Tiles*, *Lime*, *Sand*, *Terrace*, *Laths*, *Nails*, *Tyle-Pins*, *Hair*, *Loam*, *Clay*, &c. of which, in their Order.

SECT. I. *Of* BRICKS.

THE Kinds of Bricks uſed in and about *London*, are the following, *viz.* *Place Bricks*, *Grey* and *Red Stock Bricks*, and *Paving Bricks*. *Place Bricks* are the moſt ordinary Sort that are made, and are therefore uſed in *Foundations*, *Party*

Walls, *Insides of Fronts*, *&c.* of which there are two Kinds, *viz.* The *common ordinary Sort*, and another Sort, which is made with something more Neatness, *after the Manner of a Grey Stock Brick*, which are sold *at a Shilling per Thousand more* than the common Sort, and are called *Place Bricks*, *made Grey Stock Fashion.*

THESE Sort of Bricks, when thoroughly burnt, for the Uses aforesaid, are as good as Grey Stocks, and cheaper; but if they are not so, but are what is called *Samel*, they will crush in lofty Buildings, and cause Settlements, which in some Buildings have been their Ruin; and therefore, in Contracts for *Place Bricks*, it should always be stipulated, that all *Samel Bricks* be excluded.

By the *Statute* of *Edward* III. the Mould in which Building Bricks were made, was *nine Inches in Length*; *four Inches and a half in Breadth*, all in the Clear; and every Brick, when burnt, was *eight Inches and a Half in Length*, *four Inches in Breadth*, *and two Inches and a Half in Height:* But now by the *Statute* 3. *George* II. *c.* 22. *Sect.* 1. Bricks made for Sale, within 15 Miles of *London*, when burnt, shall be 8 Inches, 3 Quarters in Length; 4 Inches and 1 Eighth in Breadth, and 2 Inches and a Half in Height; on Penalty of 20*s.* *per* Thousand. *Vide* also 12 *Geo.* I. *c.* 35.

PLACE BRICKS are sold *prime Cost*, at the Brick Kilns about Town, for 11*s.* but if delivered in any Part of *London*, or *Westminster*, for 14*s.* *per* Thousand; which Bricklayers in the Li-

Liberty of *Weſtminſter*, in *Jobbing Works*, *retail at* 2*s.* *every* 80 *Bricks*, which they call (*four Turns of Bricks*,) and ſell for a 100; ſo that they are paid 25*s.* *per* 1000, which is 78, and 4 ſevenths *per Cent.* Profit, and 53, 4 ſevenths *per Cent.* Exaction, more than 25 *per Cent.* honeſt Gain. For,

As 14*s.* per Thouſand *prime Coſt*,
Is to 25*s.* the *retail Amount*,
So is 100 *l.*
To 178 *l.* and 4 ſevenths:

from which deducting 125, the Remains 53, and 2 ſevenths, is Exaction.

PLACE BRICKS are ſold in *London*, by the Company of Bricklayers, at their Wharf near *Black-Fryars*, for 20 *s.* *per* Thouſand; for which the City Bricklayers in Jobbing Works, to have the ſame Profit as their Brother-Trade have in the Liberty of *Weſtminſter*, ſhould be paid 1*l.* 15*s.* 8*d.* For as 14*s.* the *prime Coſt* at *Weſtminſter*, is to 25*s.* the *Retail Price* at *Weſtminſter*: So is 20*s.* the *Prime Coſt* at the Wharf, To 35, and 4 ſevenths: which is no more than 1*l.* 15*s.* 8*d.* *per* Thouſand. So that thoſe bought of the ſaid Company at 20*s.* *per* Thouſand Prime Coſt, are worth but 25*s.* Retail, at 25 *per Cent.* Profit; and thoſe in *Weſtminſter* at 14*s.* *per* Thouſand prime Coſt, are worth but 17*s.* 6*d.* Retail, at 25 *per Cent.* Profit.

FOUR THOUSAND *and five Hundred Place Bricks, is the common allowed Quantity to make one Rod of Work* (*viz.* 272 ſuperficial Feet,) at one Brick and a half in Thickneſs; but if they

are worked in thick Courſes of Mortar, as is commonly done, ſo as for every four Courſes in Height, to be equal to one Foot; then every Foot and a half in Length, and one Foot in Height, will contain 24 whole Bricks, which is 16 *Bricks* per *ſuperficial Foot, on the Surface of the Wall.*

Now if 272, the Number of ſuperficial Feet in a Rod, be multiplied by 16, *the Number of Bricks in a ſuperficial Foot of Brickwork*, at one Brick and a Half Thickneſs; the Product 4352 *is the greateſt Number of Bricks that can be worked up in one Rod of Place Bricks.* But as there is always ſome Waſte, and if good Care be not taken, a Shortneſs in the Tale alſo, we will therefore allow 4500 to make one Rod of Place-Brick Walling, altho', 'tis 148 Bricks more than is ſufficient.

Now 4500 *Place Bricks*, retailed in large Quantities at the exceſſive Rate of 20*s. per* Thouſand, comes to 4*l.* 10*s.* whereas at 25 *per Cent.* Profit, 17*s.* 6*d. per* Thouſand, they come but to 3*l.* 18*s.* 9*d.* which being 11*s.* 3*d.* leſs, is therefore *ſo much Exaction for the Bricks alone, in every Rod of Work.* For as *Place Bricks* are bought, *Prime Coſt delivered*, for 14*s. per* Thouſand, they are therefore worth no more Retail at 25 *per Cent.* Profit, than 17*s.* 6*d. per* Thouſand, and all leſſer Quantities, as exhibited in the following Table, *viz.*

A

A TABLE shewing the Retail Value of any Number of Place Bricks, *less than a Thousand, at* 25 per Cent. *Profit.*

Number of Bricks.	Value s.	d.	q.	Number of Bricks.	Value. s.	d.	q.
1000 —	17	6	0	70 —	1	2	2,6
750 —	11	3	0	60 —	1	0	2,2
500 —	8	9	0	50 —	0	10	1,8
400 —	7	0	0	40 —	0	8	1,4
300 —	5	3	0	30 —	0	6	1,2
200 —	3	6	0	20 —	0	4	0,8
100 —	1	9	0	10 —	0	2	0,4
90 —	1	6	3,4	5 —	0	1	0,2
80 —	1	4	3				

Which is ,$\frac{24}{100}$ of a Farthing *per* Brick.

Grey Stock and *Red Stock Bricks* are the next Kind of Building Bricks; of which, the first are used chiefly for to face the Fronts of Buildings either entirely of themselves, or mixt with Red Stocks, commonly call'd Rubb'd and Gaged Work; as in the Arches to the Heads of Windows, Fascias, Rustick Quoins, *&c.*

The Dimensions, both of *Grey* and *Red Stock Bricks*, according to the *Statute*, are the same as those of *Place Bricks:* But as they are generally laid in much thinner Courses of Mortar than Place Bricks commonly be, therefore a greater Number of Bricks must be employed in this Work, more than is commonly used in a Rod of Place Brick-work, whose Courses of Mortar are generally near, or quite double, the Thickness of those in which Stock Bricks are laid.

When *Stock Bricks* are neatly laid, 4 *Courses in Height seldom exceeds* 11 *Inches*, which is a twelfth Part less Measure on the Surface of the Wall, than the same Number of Place Bricks laid in thick Courses, and 12 Inches in Height, would produce. So that to 4500, the Number of Place Bricks allowed for a Rod of Brickwork, we must add a twelfth Part thereof, *viz.* 375 Bricks, and the Total 4875, *is the real Number of Stock Bricks required for one Rod of Work*, which is nearly 18 Bricks *per* Foot superficial, at one Brick and a Half Thickness. And therefore, any Number of superficial Feet of Stock-Brick-work done, or to be done at one Brick and a Half in Thickness, being multiplied by 18, the Product is the Number of Bricks required.

N. B. When the Thickness of the Wall is but one Brick, then two-third Parts of the Number found for one Brick and a Half in Thickness, is the Number of Bricks required, at one Brick in Thickness; and when the Thickness of the Wall is more than $1\frac{1}{2}$ Brick in Thickness, *viz.* 2, $2\frac{1}{2}$ Bricks, &c. then for every half Brick in Thickness, more than $1\frac{1}{2}$ Brick, add to the Number found, for a Thickness of $1\frac{1}{2}$ Brick, as many third Parts thereof, and the Total will be the Number of Bricks required. This is made familiar, by the Examples following, *viz.*

EX-

EXAMPLE I.

How many Bricks are sufficient to build a Piece of Walling, whose Surface contains 27, 276 superficial Feet, and whose Thickness is but 1 Brick's Length?

OPERATION:

Multiply 27276 superficial Feet
By 18 the Number of Bricks *per Foot.*

```
218208
27276
------
490968 Product.
```

Now 49,0968 the Product, being divided by 3, and the Quotient doubled, the Sum will be the Number of the Bricks required.

OPERATION.

```
3)490968(163656 Quotient
  19
  18
  --
   10
    9
   --
    19
    18
    --
     16
     15
     --
      18
      18
      --
       0
```

So

So here the Quotient 1,63,656, being doubled, the Sum is 3,27,312, which is equal to two Thirds of 4, 90,968, and is the Number of Bricks required, at 1 Brick in Thickneſs.

EXAMPLE II.

How many Bricks are ſufficient for to build the aforeſaid Piece of Walling, at 2 Bricks in Thickneſs?

To the Product 490468, which is the Number of Bricks required, at $1\frac{1}{2}$ Brick in Thickneſs, add the Quotient 163656, (which is equal to one third of the ſame Product,) becauſe the extraordinary Thickneſs is half a Brick, and the Sum, 654124, is the Number of Bricks required.

OPERATION.

To the Product	490468
add the Quotient	163656
then the Sum	654124

is the Number of Bricks required, at two Bricks in Thickneſs.

EXAMPLE. III.

How many Bricks are ſufficient for to build the aforeſaid Piece of Walling, at $2\frac{1}{2}$ Bricks in Thickneſs?

To the aforeſaid Product, 490468, add the aforeſaid Quotient doubled, becauſe here the extraordinary Thickneſs, is two half Bricks, *viz.* 327312, and the Sum is the Number of Bricks required.

OPE-

OPERATION.

To the Product	490468
add the Quotient doubled, *viz.*	327312
then the Sum	817780

is the Number of Bricks required, at 2 ½ Bricks in Thickneſs.

EXAMPLE IV.

How many Bricks are ſufficient for the aforeſaid Walling, at 3 Bricks Length in Thickneſs?

Double 4,90,468, the aforeſaid Product, becauſe the Thickneſs is doubled, and the Sum is the Number of Bricks required.

OPERATION.

To the Product aforeſaid,	490468
add	490468
and the Sum	980936

is the Number of Bricks required, at 3 Bricks Thickneſs. And ſo in like manner may be found the Number of Bricks for any other greater Thickneſs.

Now having thus explained the Manner of finding the Number of Bricks, neceſſary to make any Quantity of Walling, which I can't but think will be agreeable to many of my Readers, eſpecially to ſuch Gentlemen, and their Stewards, whom it may concern; I ſhall now beg leave to obſerve, that when the Fronts are faced with unrubbed Bricks, either Grey or Red, 'tis cuſtomary to work up their Inſides with *Place Bricks*, which, to make good Work, *their Courſes ſhould be laid in no greater a Thick-*

neſs

neſs of Mortar, than the Stock Bricks, that thereby every Courſe may be kept Level, and ſtrongly bonded together, which cannot be done when the inſide and outſide Courſes are not carried up Level, as is too often practiſed.

The Number of unrubbed *Stock Bricks, required to face a Rod of Walling,* at 1 ½ Brick in Thickneſs, is juſt a half Part of the whole, *viz.* 2437, which is nearly 9 Bricks to every ſuperficial Foot; but as in all Computations, it is beſt to allow rather more than leſs, I will therefore allow 9 Bricks per Foot, which will make Eſtimations of this Kind very eaſy; for if the Number of ſuperficial Feet, contained in any intended Front, be multiplied by 9, the Product is not only *the Number of Grey Stocks required,* but is alſo the *Number of Place Bricks required* to work up againſt them within ſide; the Thickneſs of the Wall being one Brick and a Half.

The Prime Coſt of *Grey Stock Bricks,* is according to their Goodneſs and Colour; the common dark Sort, taking them as they riſe out of the Kiln, is 18 *s. per* Thouſand, delivered in any Part of *Weſtminſter* or the Liberties thereof; but if they are picked at the Kiln, ſo as to have them all of the beſt Colour, as nearly alike as can be choſen, then their Price is from 20 to 22 *s. per* Thouſand, delivered.

N. B. Thoſe *Grey Stock Bricks,* which Bricklayers buy *Prime Coſt,* at 18 *s. per* Thouſand delivered, they generally Retail in Repairs, *&c.* at 3 *s. per* 80 Bricks, which they ſell for

for 100, as aforesaid of *Place Bricks*; which amounts to 1 *l.* 17 *s.* 6 *d.* *per* Thousand, and which is 108 $\frac{1}{3}$ *per Cent.* Profit, and 83 $\frac{1}{3}$ *per Cent.* Exaction, more than 25 *per Cent.* honest Gain. For,

As 18 *s.* the Prime Cost *per* Thousand, is to 1 *l.* 17 *s.* the Retail Amount of a Thousand, so is 100 *l.* to 208 *l.* $\frac{1}{3}$.

But as *Grey Stock Bricks* are bought *Prime Cost*, for 18 *s.* *per* Thousand delivered; they are therefore worth no more Retail, at 25 *per Cent.* Profit, than 1 *l.* 2 *s.* 6 *d.* *per* Thousand; and all lesser Quantities, as exhibited in the following Table, *viz.*

A TABLE, *shewing the Retail Value of any Number of common* Grey Stock Bricks, *less than a Thousand*, at 25 *per Cent.* Profit.

Number of Bricks.	Value. *s.*	*d.*	*q.*	Number of Bricks.	Value. *s.*	*d.*	*q.*
1000	22	6	0	70	1	6	3,6
750	16	10	2	60	1	4	0,8
500	11	3	0	50	1	1	2
400	9	0	0	40	0	10	3,2
300	6	9	0	30	0	8	0,4
200	4	6	0	20	0	5	1,6
100	2	3	0	10	0	2	2,8
90	2	0	1,2	5	0	1	1,4
80	1	9	1,4				

Which is little more than 1 Farthing *per* Brick.

AND as the best-coloured pick'd *Grey Stock Bricks*, are sold Prime Cost, for 22 *s.* *per* Thousand delivered, they are therefore worth Retail, no more than 1 *l.* 17 *s.* 6 *d.* *per* Thousand;

sand; and all lesser Quantities, as exhibited in the following Table, *viz.*

A TABLE, *shewing the Retail Value of any Number of the best-coloured* Grey Stock Bricks, *less than a Thousand, at* 25 s. per Cent. *Profit.*

Number of Bricks.	Value. s.	d.	q.	Number of Bricks.	Value. s.	d.	q.
1000	27	6	0	70	1	11	0,4
750	20	07	2	60	1	7	3,2
500	13	9	0	50	1	4	2
400	11	0	0	40	1	1	0,8
300	8	3	0	30	0	9	3,6
200	5	6	0	20	0	6	2,4
100	2	9	0	10	0	3	1,2
90	2	5	2	5	6	1	2,6
80	2	2	1,6				

Which is very little less than $1\frac{1}{3}$ Farthing *per* Brick.

RED STOCK BRICKS, and *Paving Bricks*, are sold *Prime Cost*, for 30 *s. per* Thousand delivered; and retailed by Bricklayers, at 40 *s.* wherein they exact $8\frac{1}{3}$ *per Cent.* more than 25 *per Cent.* honest Gain. For,

As 30 s. the Prime Cost,
is to 40 s. *their Retail Price:*
So is 100 l. *to* $133\frac{1}{3}$ which is $8\frac{1}{3}$ *more than* 25 per Cent. *honest Gain.*

FOR as the *Prime Cost* per *Thousand* delivered, is 30 *s.* therefore they are worth no more Retail, at 25 *per Cent.* Profit, than 1 *l.* 17 *s.* 6 *d.* and

and all leſſer Quantities, as exhibited in the following Table.

A TABLE, *ſhewing the Retail Value of any Number of* Red Stock Bricks, *commonly called* Rubbing Bricks, *being rubbed, when imployed to ornament Brickwork, and of* Paving Bricks, *leſs than a Thouſand, at* 25 per Cent. *Profit.*

Number of Bricks.	Value. s.	d.	q.	Number of Bricks.	Value. s.	d.	q.
1000	37	6	0	70	2	7	2
750	28	1	2	60		3	0
500	18	9	0	50	1	10	2
400	15	0	0	40	1	6	0
300	11	3	0	30	1	1	2
200	7	6	0	20	0	9	0
100	3	9	0	10	0	4	2
90	3	4	4	5	0	2	1
80	3	0	0				

Which is $1\frac{8}{10}$ Farthing *per* Brick.

N. B. The Dimenſions of a *Paving Brick* is as follows, *viz.* Length 9 Inches, Breadth $4\frac{1}{2}$ Inches, and Thickneſs $1\frac{1}{4}$ Inches.

9
4½
36
4½
40½
36
36
216
108
1296

IF 1296, *the Quadrature of a Yard in Inches*, be divided by $40\frac{1}{2}$ the *Area* of the Surface of a *Paving-Brick*, the Quotient 32, is the Number of Bricks *laid flat and dry*, that will cover one ſuperficial Yard. And therefore any Number of Yards required to be Paved, being *multiplied by* 32, the Product is the Number of Bricks required. Again,

IF

IF 1296, *the Quadrature of a Yard in Inches*, be divided by $15\frac{1}{4}$, the *Area* of a *Brick on Edge*, the Quotient $82\frac{2}{7}$, is the Number of Paving Bricks laid dry without Mortar, *on their Edges*, that will Pave one Square Yard. And as 'tis not possible to lay them quite close together, the Fraction $\frac{2}{7}$ may be omitted, and 82 taken for a sufficient Quantity. And therefore it follows, that any Number of superficial Yards given, being *multiplyed by* 82, the Product will be the Number of Bricks required.

N. B. *The Weight of a Place Brick and of a Grey Stock Brick are nearly equal*, viz. *about* 5 *Pounds* avoir dupois *each*; as *also is a* Paving Brick. *But the Weight of a Red Stock Brick, is generally five Pounds*, 12 *Ounces.*

Now as 500 *Bricks is a Load*, therefore a Load of *Place Brick* is 2500 Weight, as also, is a Load of *Grey Stocks*, and of *Paving Bricks*; but *a Load of Red Stocks* is 2875.

WINDSOR BRICKS, so called, from their being carried there (from GERRARD's CROSS where they are made) to be sent by Water to *London*; are chiefly used for *Furnaces* and *Potters Kilns*, as being the best for standing great Heats. They are Sold by the *Brick Merchants* at *Fleet-Ditch Side* in LONDON, *prime Cost*, at 3*l.* per Thousand, which is 2 Farthings $\frac{88}{100}$ per Brick, exclusive of Carriage.

SECT.

SECT II. *Of* TILES.

THE several Kinds of TILES made about *London*, are *Plain Tiles*, *Ridge Tiles*, *Pan Tiles*, *Paving Tiles*, and *Chimney Tiles*.

I. A PLAIN TILE, by 17 EDWARD IV. shall be 10 *Inches* ½ *in Length* 6 *Inches and a quarter in Breadth*, and ⅝ of *an Inch* (at least) *in Thickness, when burnt*.

II. A ROOF or CROSS TILE (which now is called a *Ridge Tile*) *shall be* 13 *Inches in Length*, and *Thickness as before, with convenient Depth accordingly*.

III. A GUTTER, and a CORNER Tile (which now is called a *Hip Tile*) *shall be* 10 *Inches and* ½ *in Length, with convenient Thickness, Breadth*, and *Deepness*. And *if any shall sell Tiles otherwise made, he shall forfeit to the Buyer the double Value thereof, to be recovered by Action of Debt, and besides, shall make fine and Ransom at the King's Will.*

N. B. *This Act remains still in Force.*

IV. By the STATUTE 12 GEO. I. c. 25. 'tis Enacted that all PAN TILES, which after 29 *Sept*. 1726. shall be made for Sale in *England*, shall, when burnt, be not less than 13 *Inches and a half long, nine Inches and a half wide, and half an Inch thick.*

SECT. II. *And all Persons who after 29 Sept. 1726, whose Pan Tiles when burnt shall be of less Dimensions in Length, Breadth or Thickness, than are herein before prescribed to be, shall forfeit* 10 *s. for every Thousand, and proportionably for a greater or lesser Quantity.*

PLAIN TILES are sold Wholesale at the *Kilns* about *London* for 20 *s. per Thousand*, with 10 *Ridge Tiles Included*, delivered in any Part of LONDON or *Westminster*. But when they are retailed by *Bricklayers* in the Repairs of Buildings, they are rated at 3 *s. per Hundred*, or 30 *s. per Thousand*, Exclusive of the 10 Ridge Tiles, which they charge at 1 *Penny half-penny per Tile* besides; which is $31\frac{1}{4}$ *per Cent. Exaction* more than 25 per Cent. HONEST *Gain*. For, as 20 *s.* the Prime Cost of a Thousand of plain Tiles, and 12 Ridge Tiles is to 1 *l.* 11 *s.* 3 *d.* their Retail Price: so is 100, to $156\frac{1}{4}$. Which is $31\frac{1}{4}$ *per Cent.* more than Honest Gain at 25 *per Cent.*

FOR, as plain Tiles are sold *prime Cost* at 20*s. per Thousand* delivered, (without any regard being had to the Value of the 10 Ridge Tiles) *they are* therefore *worth no more Retail at* 25 *per Cent. Profit, than* 1*l.* 5 *s. per Thousand*; and all lesser Quantities, as exhibited in the following Table, *viz.*

A

A TABLE, *shewing the retail Value of any Number of* PLAIN TILES, *less than a Thousand, at* 25 s. per Cent. *Profit.*

Number of Plain Tiles.	Value. *l.*	*s.*	*d.*	Number of Plain Tiles.	Value. *l.*	*s.*	*d.*
1000	1	5	0	70	0	1	9
750	0	18	9	60	0	1	6
500	0	12	6	50	0	1	3
400	0	10	0	40	0	1	0
300	0	7	6	30	0	0	9
200	0	5	0	20	0	0	6
100	0	2	6	10	0	0	3
90	0	2	3	5	0	0	$1\frac{1}{2}$
80	0	2	0				

Which is $1\frac{1}{5}$ Farthing *per* Tile.

THE *Quantity* or *Number of Plain Tile required to cover one Square of Work* (viz. 100 superficial Feet) is according to the *Gage* at which they are to be laid.

THE *different Gages* at which *plain Tiles* are laid, are generally *Three*, viz. 6 Inches, 7 Inches and 8 Inches. That is, the upper Edge of every other Lath is nailed exactly at some one of those Distances, which is called the *Gage*; and *between every two of them* is nailed another Lath, whose upper Edge is placed as nearly in the Middle between the others as can be done by Sight, without Measuring. So that in every Gage of 6, 7, or 8 Inches, there are *two Courses of Tiles*.

AND therefore it follows, *that every Course of Tiles has but Half of the Gage* they are laid at, clear to the Weather, *viz.*

$$\text{THOSE of}\left\{\begin{array}{l}6\\7\\8\end{array}\right\}\begin{array}{l}\text{Inches}\\\text{Gage}\\\text{have but}\end{array}\left\{\begin{array}{l}3\\3\frac{1}{2}\\4\end{array}\right\}\text{Inches clear.}$$

And as the Breadth of a Plain Tile is $6\frac{1}{4}$ Inches: therefore

$$6\tfrac{1}{4}\ \text{Inches mutilplied by}\left\{\begin{array}{l}\text{Inches.}\\3\\3\frac{1}{2}\\4\end{array}\right\}\text{the Product}\left\{\begin{array}{l}\text{Inches.}\\18\frac{3}{4}\\22\\25\end{array}\right\}\text{is the Quantity or Area covered by 1 Tile.}$$

AND if 14400, the *Quadrature of* 120, the Number of Inches in a Length of 10 Feet, the Side of a Square of Work, be divided *first* by $18\frac{3}{4}$, *secondly* by 22, and *lastly* by 25,

$$\text{THE Quotient}\left\{\begin{array}{l}768\\654\frac{6}{11}\\576\end{array}\right\}\text{is the Number of Tiles to 1 Square of Work, at}\left\{\begin{array}{l}6\\7\\8\end{array}\right\}\text{Inch-Gage.}$$

$$\text{AND \textit{again, if any given Number of Squares of Work, be multiplied by}}\left\{\begin{array}{l}768\\655\\576\end{array}\right\}\text{\textit{the Product} will be the N° of \textit{Tiles} required at a}\left\{\begin{array}{l}6\\7\\8\end{array}\right\}\text{Inch-Gage.}$$

RIDGE TILES, when bought without *plain Tiles*, are sold *prime Cost* at the *Kilns* for 6 *s. per Hundred* delivered, which is $2\frac{88}{100}$ *Farthings per Tile*, and which the *Bricklayers* have the Modesty to retail at 1 *d.* ½ per Tile, or 12 *s.* 6 *d.* per *Hundred*, and therein *exact* 86 *per Cent. more* than 25 per Cent. HONEST *Gain*. For,

As

As 6 *s.* the *prime Cost per Hundred is to* 12 *s.* 6 *d. their retail Price; so is* 100 *to* 211, *which (as before observed) is but* 86 *per Cent. Exaction*, over and above 25 *per Cent.* Honest *Gain.*

Note, In new plain Tiling, *the Bricklayer ought not* to make any Charge for Ridge Tiles, because they are always included in the *prime Cost* of the *plain Tiles*, unless every Thousand of *plain Tiles* require more than 10 *Ridge Tiles*, and then the overplus Quantity more than 10 to a Thousand must be paid for *extra*, at 7 *s.* 6 *d.* per Hundred, and no more, or 1 *d.* per Tile, for any Number under a Hundred. For, as 100 is to 125; so is 6 *s.* the prime Cost per Hundred, to 7 *s.* 6 *d.* the Honest retail Price at 25 per Cent. Profit.

Pan Tiles are also sold *prime Cost* at the *Kilns* for 6 *s. per Hundred*, and are retailed by *Bricklayers* at 1 *d.* ½ *per Tile.* So that they *exact* 83 per Cent. therein, the same as in *Ridge Tiles.*

For, as *Pan Tiles* and *Ridge Tiles* are sold *prime Cost* at 6 *s.* per Hundred, delivered; they are therefore *worth no more retail* at 25 per Cent. Profit, *than* 7 *s.* 6 *d. per Hundred*, or 3 *l.* 15 *s. per Thousand*; and all Quantities less than a Thousand, as exhibited in the following Table, *viz.*

A TABLE, *shewing the retail Value of any Number of* PAN TILES *or* RIDGE TILES *less than a Thousand, at 25 per Cent. Profit.*

Number of Tiles.	Value. l.	s.	d.	Number of Tiles.	Value. l.	s.	d.
1000	3	15	0	70	0	5	3
750	2	16	3	60	0	4	6
500	1	17	6	50	0	3	9
400	1	10	0	40	0	3	0
300	1	2	6	30	0	2	3
200	0	15	0	20	0	1	6
100	0	7	6	10	0	0	9
90	0	6	9	5	0	0	4½
80	0	6	0				

Which is 3 $\frac{6}{10}$ Farthings per Tile.

GLAZED PAN TILES are infinitely preferable to the Unglazed, because the Rains cannot penetrate them, as they frequently do the Unglazed; and their Colour being a dark Purple, has a much more agreeable Effect on the Eye.

THE first *Glazed Pan Tiles* used in *England* were brought here from *Holland*; but now many of our *English Tile-makers* make them equally as good as those made by the *Dutch*, and particularly Mr. BARRET of *Brentford*, who delivers them in *London* or *Westminster* at 6 *l.* per Thousand, which *Bricklayers* in Repairs, *&c.* retail at 2*d.* *per Tile*; and therein *exact* 13 $\frac{1}{6}$ per Cent. more than 25 per Cent. HONEST *Gain*.

For,

For, as 12 *s.* per Hundred *prime Cost*,
Is to 16 *s.* 8 *d.* their *retail Price:*
So is 100, to 138 $\frac{1}{6}$; which is nearly 14 *per Cent. Exaction* above 25 per Cent. HONEST *Gain.*

And as *Glazed* RIDGE and PAN TILES are sold *prime Cost for* 12 *s. per Hundred* delivered; they are therefore *worth no more retail* at 25 Cent. Profit, *than* 15 *s. per Hundred*, or 7 *l.* 10 *s. per Thousand*; and all Quantities less than a Thousand, as exhibited in the following TABLE, *viz.*

A TABLE *shewing the Retail Value of any Number of Glazed* RIDGE *or* PAN TILES, *less than a Thousand, at* 25 *per Cent. Profit.*

Number of Tiles.	Value. *l.*	*s.*	*d.*	Number of Tiles.	Value. *l.*	*s.*	*d.*
1000	7	10	0	70	0	10	6
750	5	12	6	60	0	9	0
500	3	15	0	50	0	7	6
400	3	0	0	40	0	6	0
300	2	5	0	30	0	4	6
200	1	10	0	20	0	3	0
100	0	15	0	10	0	1	6
90	0	13	6	5	0	0	9
80	0	12	0				

Which is 1 *d.* 3 *q.* $\frac{2}{10}$ per Tile.

PAN TILES are generally, or at least ought to be, *laid* at a 10 *Inch Gage*, whereby they have *a Lap downwards of* 3$\frac{1}{2}$ *Inches*, and leave

10 Inches clear to the Weather; and as they are generally laid with a *side Lap of* $1\frac{1}{2}$ *Inch*, therefore the *Area* of each *Tile* to the Weather will be 10 by 8, equal to 80 ſquare Inches.

Now if 14400, the Number of *Square Inches in a Square*, (or 100 Square Feet) of Work, be divided by 80, *the Square Inches of Weathering in one Tile*, the Quotient 180, is *the Number* of *Pan Tiles required to cover a Square of Work*. And therefore *if any given Number of Squares* of Work done, or to be done, *be multiplied by* 180, the Product will be the Number of *Pan Tiles* required; and which being rated at the *Prime Coſt of the Country*, *per Hundred*, will ſhew the Expence.

PAVING TILES for the Ground Floors of *Offices*, &c. *are made of two Sizes*; the one called *Foot Tiles*, which when burnt, hold $11\frac{1}{2}$ *Inches ſquare, and* 1 *Inch and* $\frac{1}{2}$ *in Thickneſs*; the other called *Ten Inch Tiles*, which when burnt, hold $9\frac{1}{2}$ *Inches ſquare*, and 1 *Inch in Thickneſs*.

THESE Kinds of Tiles are made and ſold Prime Coſt by Mr. DEAN near *May Fair*, and Mr. HARRIS at the *Pinner of Wakefield* near *Grays Inn Lane*, the *Foot Tiles* at 20*s*. *per Hundred*, which is 2*d*. 1*q*. $\frac{6}{10}$ *per Tile*; and the 10 *Inch Tiles* at 8*s*. *per Hundred*, which is 3 $\frac{84}{100}$ Farthings *per Tile*.

FOOT

FOOT TILES are retailed by Bricklayers at 4 *d. per Tile*, which is 1 *l.* 13 *s.* 4 *d. per Hundred*, and therein they *exact* 41 $\frac{13}{20}$ per Cent. For

As 20 s. *the prime Cost of a Hundred*,
Is to 33 s. 4 d. *their retail Price:*
So is 100 l. *to* 166 l. $\frac{13}{20}$; *which is* 41 l. $\frac{13}{20}$ *per Cent. Exaction*, above 25 per Cent. Honest Gain.

TEN INCH TILES are retailed by *Bricklayers* at 2 *d. per Tile*, which is 16 *s.* 8 *d. per Hundred*, and therein they *exact* 83 $\frac{1}{4}$ *per Cent.*

For *as* 8 s. *the prime Cost of a Hundred*,
Is to 16 s. 8 d. *their retail Price:*
So is 100 l. *to* 208 l. $\frac{1}{4}$; *which is* 83 l. $\frac{1}{4}$ *per Cent. Exaction*, above 25 per Cent. Honest Gain.

BUT as *Foot Tiles* are sold *prime Cost* at 20 *s. per Hundred* delivered; they are therefore, at 25 *per Cent.* Profit, *worth no more than* 1 *l.* 5 *s. per Hundred*, or 12 *l.* 10 *s. per Thousand*, Retail; and all Quantities less than a Thousand, as exhibited in the second Column of the following Table.

AND as *Ten Inch Tiles* are sold *prime Cost* delivered, at 8 *s. per Hundred*, they are therefore *worth no more Retail* at 25 *per Cent.* Profit, *than* 10 s. *per Hundred*, or 2 l. 10 s. *per Thousand*; and all Quantities less than a Thousand, as exhibited in the third Column of the following Table, *viz.*

A

A TABLE *shewing the retail Value of* FOOT *and* TEN INCH *Paving Tiles, at* 25 *per Cent. Profit.*

Number of Tiles.	Value of Foot Tiles.			Value of 10 Inch Tiles.			Number of Tiles.	Value of Foot Tiles.			Value of 10 Inch Tiles.		
	l.	*s.*	*d.*	*l.*	*s.*	*d.*		*l.*	*s.*	*d.*	*l.*	*s.*	*d.*
1000	12	10	0	5	0	0	70	0	17	6	0	7	0
750	9	7	6	3	15	0	60	0	15	0	0	6	0
500	6	5	0	2	10	0	50	0	12	6	0	5	0
400	5	0	0	4	0	0	40	0	10	0	0	4	0
300	3	15	0	1	10	0	30	0	7	6	0	3	0
200	2	10	0	1	0	0	20	0	5	0	0	2	0
100	1	5	0	0	10	0	10	0	2	6	0	1	0
90	1	2	6	0	9	0	5	0	1	3	0	0	6
80	1	0	0	0	8	0							

Which is 3 *d.* per *Foot Tile*, and 1 *d.* $\frac{2}{10}$ of a Farthing per 10 *Inch Tile.*

N. B. When *Foot Tiles* are made of good Earth, and well burnt, they make good and cheap *Coping* for 9 Inch Walls, being well Bedded in good Mortar, made with Sea-coal Aſhes and hot Lime.

CHIMNEY TILES, commonly call'd *Gally Tiles*, for to ſet the *Coved Sides of Chimnies*, were firſt brought here from *Holland*, and are yet ſo continued, as being made of a free kind of Earth, that will rub on a Stone; which thoſe made by the *Engliſh Potters* at *Lambeth*, &c. will not ſo freely do, and are therefore troubleſome to Gage and Set.

THERE

THERE are divers Kinds of theſe *Dutch Tiles*, *viz.* entirely *White*, *Marbled*, and *Painted* with divers Devices, as *Landſcapes*, *&c.* in blue and white Colours.

THE *White Sort* is ſold by the large Dealers in *Earthen Wares*, at 2*d* *per Tile*, the *Marbled-kind* at 3*d.* and the *Painted* at 3*d.* at $3\frac{1}{2}$, and 4*d.* *per Tile*, according to their Goodneſs of Work.

EVERY four *Tiles* is call'd a ſquare Foot, and ſo paid for; tho' in Fact they meaſure, when Gaged and Set, *not more* than 100 ſquare Inches (*each Tile being but* 5 *Inches ſquare*) whereas a *ſquare Foot contains* 144 *ſquare Inches*; ſo that 4 *Tiles* are very little more than 2 third Parts of a ſquare Foot, which is 96 ſquare Inches. AND *therefore*,

In making Computations of the Quantity of Tiles required for any Number of ſquare Feet, there muſt always be 6 *Tiles allow'd to every ſquare Foot of Work.*

WHEN theſe *Tiles* are retailed by *Bricklayers*, they muſt be paid for them no more

Than $\begin{cases} 2\frac{1}{2}\ d.\ per \text{ Tile for the White,} \\ 3\frac{1}{4} \text{ for the Marbled, and} \\ 5 \text{ for the beſt painted ſort.} \end{cases}$

Which is at the Rate of 25 *per Cent.* *neat Profit.*

N. B. THESE Sorts of *Tiles* are made by the *White Potters* at *Lambeth*, and by Mr. OADES at his Pot-Houſe in *New-Gravel-Lane* in *Southwark*, where there is a very great Choice.

Choice. But I think not any of them can be rubb'd and gaged with that Neatneſs as can be with *Dutch Tiles,* unleſs they have very lately made that Improvement by moderately *opening the Body of their Clay with* Woolwich *Sand,* which I think is no difficult Matter to do.

Now having thus ſhewn the ſeveral *Dimenſions*, *Exactions* and *Prices* of *Bricks* and *Tiles*, together with the manner of finding the Number of each, that will *complete any given Quantity of Rods*, *Squares*, *Yards*, *Feet*, &c. of Work, I ſhall now proceed to explain the ſame of *Lime*, *Sand*, &c. of which the *Cements* or *Mortars* in which they are laid, are made.

SECT. III. *Of* LIME.

THE *Lime* uſed in common for *Mortar* in *London*, is made of *Chalk* calcined in a *Kiln*; of which very large Quantities are brought out of *Kent* and *Eſſex* by Water to *London*, where the *Lime Merchants* ſell it unſlacked, for 9*s. per* Hundred delivered; which Bricklayers retail at 12*s.* 6*d. per* Hundred, and therein exact $13\frac{8}{9}$ *perCent.* above 25 *perCent.* honeſt Gain. For

As 9*s.* the prime Coſt *per* Hundred is to 12*s.* 6*d.* the Retail Price:

So is 100, to $138\frac{8}{9}$; which is $13\frac{8}{9}$ at 25 *per* Cent. above Honeſt Gain.

A

A *Hundred* of *Lime* is 25 Bushels, *Winchester striked Measure*, which is generally sent in 25 Bags, that should each contain a *Bushel* as aforesaid: But very few *Lime Bags* will contain a *Bushel*, even when filled, and 'tis very seldom that they are so; for I think there is no Trade belonging to the Business of Building, so guilty of short Measure, as *Lime Merchants* or their Servants, if not carefully look'd after.

A *Winchester Bushel*, striked Measure, contains 2256 *Cube Inches*, (which is equal to 8 Gallons, each Gallon equal to 282 *Cube Inches*;) and so much every Bag of *Lime* ought to contain.

To find if a Bushel Measure be Just or False.

RULE.

Multiply the square Inches contain'd in the *Area* of *its Bottom*, by the Number of Inches and Parts contained in its *Depth*; and if the Product be equal to 2252, (*the Number of Cube Inches in a Winchester striked Bushel*) it is a Just Bushel; but if less, 'tis False.

Now as 25 striked Bushels of *Lime* is called a *Hundred*; and as *Lime* in and about *London* is sold by the *Hundred*; therefore if 2252, the Cube Inches in a *Winchester Bushel* striked, be multiplied by 25, the Number of striked *Bushels in* a *Hundred*, the Product 56300, is the Number of Cube Inches, which every Quantity of *Lime* delivered for a *Hundred* ought to contain.

THE

THE Meaſure by which *Bricklayers* meaſure *Lime*, at their receiving it from the *Lime Merchant*, is a bottomleſs Cube Veſſel, whoſe *Root* or *Side* is 3 Feet 1 Inch, and whoſe *Cube quantity* is but 50653 Inches.

NOW if 50653, the Number of Cube Inches in the aforeſaid Meaſure, be ſubtracted from 56300, the Number of Cube Inches in a *Hundred*, or 25 *Buſhels of Lime*; the remains is 5647 Cube Inches, which is ſomething more than 2 Buſhels, and which every ſuch Meaſure is *leſs*, and wants of being an *Honeſt Hundred* of *Lime*.

BUT if the *Side* or *Roof* of the ſaid *hollow Cube* be made $38\frac{1}{8}$ Inches, *viz.* $38\frac{1}{8}$ Inches ſquare within in the Clear, and as much in Depth, it will contain when filled level, but 205 Cube Inches, which is not 3 Quarts more than 25 ſtriked Buſhels.

For the Cube of $38\frac{1}{8}$ Inches is 56505 Cube Inches; and the Cube Inches in 25 Buſhels is 56300, which is but 205 Cube Inches Difference, which is leſs than $\frac{1}{4}$ of a Gallon, *viz.* of 282 Cube Inches.

N. B. IN filling of the aforeſaid Box or Frame, Care ſhould be taken *that the Bags are not all emptied at one Corner* only; becauſe then the largeſt Parts of the Lime *rowl away to the oppoſite Sides*, &c. where they cauſe very large Vacuities between them, capable of containing a great deal of leſſer Lime Stones, which cannot intermix as ought to be done to have HONEST *Meaſure*, and which I have

often

often found has amounted to upwards of *Two Bushels in every* 25.—And therefore to prevent such *Fraud*, as much as may be, *cause the Bags to be emptied into every Part* alike, as near as possible, keeping the *Lime spread level* as 'tis filled in, and then you will be sure to have HONEST *Measure*.

AT and about *Christ-Church* in *Hampshire*, where there is *exceeding good Lime made with the Rubble of Purbeck Stone*, it is sold by the *Hundred or Tun Weight*; by which, no *Fraud* can be exercised; and was the LEGISLATURE to enact, that *Lime* throughout the Kingdom should be so sold, and that all *Lime under burnt* should not be paid for, as being not only useless, but an Imposition on the Buyer, it would be an universal Service done to the *Publick*: For it is not here in *London* only, that *Frauds in the Measure of Lime* are practised, but 'tis so *in all Parts of the Kingdom* besides, where the *Lime Burners* pretend to sell it by the Hundred, or by the *Load*, which in some Parts is 30 *Bushels*, and in other 32 *Bushels*; and therefore is a Grievance, which calls out universally for Redress.—At *Shoreham* in *Kent* I was an Eye-Witness to a *Waggon-Load* of *Lime*, said to contain 100 *Bushels*, which I caused to be measured by the *Lime-man's own Hands*, who, with all his Art used in filling it in lightly, could not make of it *quite* 70 *Bushels striked Measure*, which was full 30 *Bushels* less than he delivered it for.

In contracting for a considerable Quantity of *Lime*, it should be bargained with the *Lime Merchant*, &c. that in Case there *be much Waste in it* by *Lime Stones* (which are nothing but Chalk Stones under burnt, and therefore will not slack) an equal Quantity of good Lime be given in lieu of such Waste; for as they are paid for real good Lime, all of it ought to be so.

And *it must be observed*, that you buy not *Lime ready slacked* at the same Price, and the same striked Measure, as unslacked Lime is sold. Because, then you will not have quite four Fifth Parts of your Measure. *For I have experienced*, (as any other Person may do) *that a striked Bushel of Lime unslacked, will measure, when slacked, something more than* five striked Peeks, which is above one Fifth Part increase.

When *Bricklayers retail Lime entirely slacked*, at the same Rate as they do *unslacked Lime*, *viz.* 6 *d.* per striked *Bushel* or *Bag*, they have 50 *per Cent.* Profit.

For as 5 *d.* allowed for the prime Cost of one Bushel of Lime and for slacking it, is to 7 *d.* ½ the retail Price of five Pecks, which 'tis then increased to; so is 100 to 150, which is 50 *per Cent.* Profit, and 25 *per Cent. Exaction*, above 25 *per Cent.* Honest *Gain.*

Un-

UNSLACKED LIME Retailed at 25 *per Cent.* Profit, is 11 *s.* 3 *d.* *per* Hundred, or 5 *d.* $\frac{62}{100}$ *per Bushel*; and *Slacked Lime* at 4 *d.* and $\frac{12}{25}$ of a Penny, striked Measure.

It is also to be noted, That when *Lime* is kept any considerable Time after drawn from the Kilns, before used, the *Humidity of the external Air* being imbib'd by it, *will slack it as it lies in the Store-house*, and its Strength is found by Experience to be thereby impaired; and that more in the *Winter* when the *Air is replete with Moisture*, than in the *Summer*; wherefore 'tis evident, that every Store-house for *Lime* should be kept dry, and close from the external Air.

SECT. IV. *Of* SANDS.

THE Kinds of *Sands* used for Buildings in LONDON, are generally either *Pit Sand* or *Thames Sand*; unless by JOBBING *Bricklayers*, who often use *Glass-Grinders Sand*, after being done with by the Grinders.

PIT SAND is generally either mixt with a small Quantity of *Loam*, or entirely of a *sharp Grit*. That which is mixt with *Loam* requires *less Lime* than the other, but then 'tis only fit for Inside Works.

Both these Kinds of Sands, as also *Thames Sand*, are delivered at about 3 *s. per* Load, but if fetched, at 2 *s.*

A Load of Sand is 24 *heaped Bushels.* Glass-Grinders Sand is sold by them at ½ Penny *per half Bushel* Basket heaped, and fetched from them.

Sect. V. *Of the various Kinds of* Cements, *or* Mortars, *used in Buildings.*

The several Kinds of Mortar used in Buildings are *Eight*, viz.

1. Inside and Outside Mortar, made of *Lime* and *Sand.*

2. Terrace Mortar, made of *Lime* and *Terrace.*

3. Brick-dust Mortar, made of red *Stock Brick-dust* and *Lime.*

4. Bastard Terrace, made of a Smith's *Forge Ashes* and *Lime.*

5. Pargetting Mortar, made of *Lime* and *Horse-dung.*

6. Furnace Mortar, for Furnaces, Ovens, Kilns, &c. made of *Woolwich Loam* or of *Windsor Loam* only.

7. Plais-

7. PLAISTER MORTAR, made of calcin'd *Alabaster*.

8. FINE MORTAR, called PUTTY, for *rubbed* and *gaged Works*, made of Lime only. Of all which in their Order; and,

I. *Of* INSIDE MORTAR.

INSIDE MORTAR is used for *Vaulting*, *Foundations*, *Partition* and *Party Walls*, *Insides* of *Fronts*, and other Parts, which are hid from the Eye and not exposed to the Weather.

THIS *Kind of Mortar* is generally made with *Pit-sand*, which requires *more or less Lime*, as it abounds more or less with *loamy Particles*; and therefore when *Pit-sand* is of a *loamy fat Nature*, to 1 Load, (*viz.* 24 heaped Bushels) put 1 *Hundred of Lime*; but when it is a *clean sharp Grit* as *Thames Sand*, then to 1 *Load of Sand* put 1½ *Hundred of Lime*, which mix up together as the Lime is slacked, in small Quantities. And since that *a Hundred of unslacked Lime is just* 20 *heaped Bushels*, therefore in the first Case of loamy Sand, the Quantity of Lime is to the Quantity of Sand, as 20 is to 24; that is, in the least Terms, *as* 5 *is to* 6, viz.

5 of LIME, to 6 of SAND.

AND in the 2d Case, of a *sharp Grit or*

Drift-sand, the Lime is to the Sand as 30 is to 24, or as $7\frac{1}{2}$ is to 6, *viz.*

$7\frac{1}{2}$ of LIME, to 6 of SAND.

The Expence, prime Cost, of making a Hundred of Lime into inside Mortar with loamy Sand, is as follows, viz.

1 Hundred of Lime	0	9	0
1 Load of Sand	0	3	0
A Labourer $\frac{1}{4}$ Day, to slack, sift, turn up and chaff	0	1	6
	0	13	6

THE Quantity of Mortar which the aforesaid Lime and Sand will produce, is upwards of 50 heaped Bushels, which will make 100 *Hods*, much larger than any that are sold in the Repairs of Buildings, very frequently by many for 6 *d.* but never for less than 4 *d. per* Hod.

NOW in the first Case, when Inside Mortar is retailed at 6 *d. per* Hod, the Retailer has 270 *per Cent.* Profit.

For, *as* 13 s. 6 d. *the prime Cost of* 100 *Hods*, *is to* 50 s. *the Amount at* 6 d. per *Hod*: *so is* 100 l. *to* 370 l. $\frac{10}{27}$; *which is* 270 per Cent. *Profit*. And,

IN the second Case, when Sand-Mortar is retailed at 4 *d. per* Hod, the Retailer has 143 *per Cent.* Profit.

For,

For, *as* 13 s. 6 d. *the prime Coſt of* 100 *Hods*, *is to* 33 s. 4 d. *the Amount at* 4d. per *Hod*, *ſo is* 100 l. *to* ,243 l. *which is* 143 per Cent. *Profit*.

Now, if from 270 *per Cent*. Profit, at 6 *d. per* Hod, we ſubſtract 25 *per Cent*. (which is allowed as a reaſonable Gain in the retailing of ſmall Quantities) the Remains 245 *per Cent*. is *Exaction above real Value*.

And if from 143 *per Cent*. Profit, at 4 *d. per Hod*, we ſubſtract 25 *per Cent*. as before, the Remains is 118 *per Cent*. Exaction.

By divers Experiments I have found, that 50 *heaped Buſhels of unſlacked Lime and Sand together, are fully ſufficient for to do* 1 *Rod of Brickwork*, viz.

I. For Inside Mortar made with *loamy Sand*,

25 Heaped Buſhels of *Lime*, with
25 Ditto of *Sand*.

Sum 50.

II. For Inside Mortar made with a *ſharp Grit-ſand*,

28 Heaped Buſhels of *Lime*, with
22 Ditto of *Sand*.

Sum 50.

The *Expence of the preceding* Mortars per *Rod, is as follows,* viz.

I. *Of the first Kind, with loamy Sand.*

25 Heaped Bushels of *Lime*, equal to 1 *Hundred* and a 5th of a *Hundred*, at 9 *s.*	0	10	10
25 Ditto of *Sand*, at 1 *d.* $\frac{1}{2}$	0	3	1$\frac{1}{2}$
A Labourer $\frac{1}{4}$ Day, to *slack*, *skreen*, *turn up*, and *chaff*,	0	1	6
Total per *Rod*	0	15	5$\frac{1}{2}$

II. *Of the second Kind with sharp Sand.*

28 Heaped Bushels of *Lime* equal to 1 Hundred and $\frac{2}{5}$ at 9 *s.*	0	12	8
22 Ditto of *Sand* at 1 *d.* $\frac{1}{2}$	0	2	9
A Labourer $\frac{1}{4}$ Day to *slack*, *skreen*, *turn up* and *chaff*,	0	1	6
Total per *Rod*	0	16	11

N. B. In all these Computations of the Expence of making *Mortars*, 'tis supposed that the Labourer has *Water ready at Hand*, that is, near to his Work; and therefore when it is not so, *there must be a reasonable Allowance made for his Time in going for it*, or another Labourer imployed for that purpose.

And

AND whereas very often it happens that *Lime*, by the *Humidity of the Air only*, will ſlack as it lies in the Store-Houſe, as before obſerved; and whereas *a ſtriked Buſhel* of unſlacked Lime will, when ſlacked, make ſomething more than a heaped Buſhel, equal to five ſtriked Pecks; therefore when Lime happens to be ſo ſlacked, there muſt be 25 *heaped Buſhels*, or 31 $\frac{1}{4}$ *ſtriked Buſhels, allowed for every Hundred of Lime.*

AND for the ſame Reaſon, there muſt be 6 $\frac{1}{4}$ *ſtriked Pecks of ſlacked Lime, allowed for every heaped Buſhel of unſlacked Lime,*

For as 4 ſtriked Pecks unſlacked, is to 5 ſtriked Pecks when ſlacked, ſo is 5 ſtriked Pecks unſlacked to 6 $\frac{1}{4}$ ſtriked Pecks when ſlacked.

II. *Of the* OUT-SIDE MORTAR.

OUT-SIDE MORTAR for Fronts, Tiling, *&c.* expoſed to the Weather, ſhould be made with the ſharpeſt Grit-ſand that can be had, as being beſt able to withſtand the Inſults of Rains, *&c.* which *Loamy Sands*, cannot ſo well do — and which therefore ſhould not be uſed in any Part of a Building, that is expoſed to the Weather.

THE *Proportion that the Lime ſhould have to the Sand*, is as 2 is to 1. *viz.* 2 heaped Buſhels of *unſlacked Lime* to 1 ditto of *Sand*;

 and

and therefore if 50, the Number of heaped Bushels of Lime and Sand requisite for 1 *Rod* of Brickwork, be divided by 3, the Quotient 16 $\frac{2}{3}$ is the Number of Bushels of *Sand*; and twice that Quantity, *viz.* 33 $\frac{1}{3}$, is the Number of Bushels of *Lime* for 1 *Rod*, whose Expence is as follows, *viz.*

33 $\frac{1}{3}$ *heaped Bushels of Lime* equal to 41 $\frac{3}{4}$ *Bags* or *striked Bushels*, at 9 *s.* per Hund. is	0	15	0
16 $\frac{2}{3}$ Bushels of *Sand* at 1 *d.* $\frac{1}{2}$	0	2	0$\frac{1}{2}$
A Labourer $\frac{3}{4}$ Day to *slack*, *skreen*, *turn up* and *chaff*,	0	1	7$\frac{1}{2}$
Total Expence *per Rod*	0	18	8

Now supposing as before, that these 50 Bushels of *Lime* and *Sand* make but 100 *Hods of Mortar*, each to contain $\frac{1}{2}$ *a Bushel* (which none do, that are sold by *Bricklayers*) at 6 *d. per Hod*; the amount is 2 *l.* 10 *s.* which is 1 *l.* 11 *s.* 4 *d.* or 167 and upwards *per Cent.* Profit.

For as 18 *s.* 8 *d.* the prime Cost, is to 2 *l.* 10 *s.* the retail Price; so is 100 *l.* to 267 *l.* which is 167 per Cent.

To find the prime Cost per Hod, of In-side and Out-side Mortars.

I. Of

I. *Of* IN-SIDE MORTAR.

RULE.

DIVIDE 812, the Farthings in 16 *s.* 11 *d.* the *prime Coſt of the Mortar* for one *Rod*, by 100, the Number of $\frac{1}{2}$ Buſhel *Hods*, which 50 Buſhels of *Lime* and *Sand* will produce; and the Quotient 8 $\frac{12}{100}$ *is the Farthings per Hod*, which is very little more than 2*d.*

II. *Of* OUT-SIDE MORTAR.

RULE.

DIVIDE 896, the Farthings in 18 *s.* 8 *d.* the *prime Coſt* of *Mortar for one Rod*, by 100, as before, and the Quotient 8 $\frac{26}{100}$, is *the Farthings per Hod*; which is not quite 2 *d.* $\frac{1}{4}$.

To find the prime Coſt of Out-ſide or Inſide Mortar for one Rod of Brickwork in any Part of the Kingdom.

I. *Of* IN-SIDE MORTAR.

RULE.

To the *prime Coſt* of 35 ſtriked Buſhels of *Lime*, and of 22 heaped Buſhels of *Sand*, at the Market-Price of the Country, add $\frac{3}{4}$ of a Day *Labourers Wages*, and the Total will be the Expence *per Rod*.

II. *Of* OUT-SIDE, *or beſt* MORTAR.

To the *prime Coſt* of 41 $\frac{3}{4}$ ſtriked Buſhels of *Lime*, and of 16 $\frac{2}{3}$ heaped Buſhels of *Sand*, as before, add $\frac{3}{4}$ of a Day *Labourers Wages*, accord-

according to the Rate of the Country, and the Total will be the Expence *per Rod.*

III. *Of* TERRACE MORTAR.

As *Lime Mortars* are made of *Lime* and *Sand*, ſo *Terrace Mortars* are made of *Lime* and *Terrace.*

TERRACE *is a Kind of Sand* brought from *Holland*, but from whence the *Dutch* have it, is unknown to me. It is ſold by the *Brick* and *Lime Merchants* in *London*, and particularly by thoſe on the *Fleet-Ditch-ſide*, at 3 *s.* 6 *d. per ſtriked Buſhel*, and ſometimes for leſs Money.

TERRACE MORTAR is chiefly uſed in Walls expoſed to *Water*, as to *Rivers*, *Ponds*, *Ciſterns*, *Bog-Houſes*, *Cold Baths*, &c.

THE *beſt Terrace Mortar* is made with *two Buſhels*, &c. *of hot Lime*, and *one Buſhel*, &c. *of Terrace*, well incorporated by beating. And which Quantity to beat well, is a good Day's Work for a Labourer.

The prime Coſt of Terrace Mortar ſo made, is as follows, viz.

One Buſhel of *Terrace* —	0	3	6
Two ſtriked Buſhels of *unſlacked Lime*	0	0	9
A *Labourer* one Day to beat, &c.	0	2	2
Total	0	6	5

NOW

Now these three Bushels of *Lime* and *Terrace* together *will make 6 large Hods of Mortar*, which *Bricklayers* retail at 3 *s.* 6 *d. per Hod*, and thereby have upwards of 127 *per Cent.* clear Profit.

For as 6 *s.* 5 *d.* the prime Cost of 6 Hods, (which is nearly 1 *s.* 1 *d. per* Hod) is to 21 *s.* the retail Price, at 3 *s.* 6 *d. per* Hod, so is 100 to $227\frac{21}{77}$; which is $102\frac{21}{77}$ *Exaction*, more than 25 *per Cent.* Honest Gain.

But notwithstanding that the Profit is so very large, *yet* 'tis very seldom that *Bricklayers* put *less* than 3 *Bushels of Lime to* 1 *Bushel of Terrace*, their *Avarice* is so great, which will make 8 large Hods, and which they retail at 3 *s.* 6 *d. per Hod*, as before, and thereby have 312 *per Cent. clear Profit.*

Demonstration.

I. *The prime Cost is as follows*, viz.

1 Bushel of Terrace	0	3	6
3 Striked Bushels of unslack'd Lime	0	1	$1\frac{1}{2}$
1 Labourer 1 Day to beat, &c.	0	2	2
Total	0	6	$9\frac{1}{2}$

II. As the Amount of 8 Hods at 3 *s.* 6 *d. per* Hod, is 1 *l.* 8 *s.* 0 *d.* therefore from 1 : 8 : 0 substract 6 *s.* $9\frac{1}{2}$ *d.* the prime Cost, and the Remains 1 *l.* 1 *s.* $2\frac{1}{2}$ *d.* is the *Bricklayer*'s Profit; which is 312 *per Cent.*

For

For as $81\frac{1}{2}$ Pence equal to 6 *s.* $9\frac{1}{2}$ *d.* the *prime Cost* of 8 *Hods*,

Is to 336 Pence, equal to 1 *l.* 8 s. 0 *d.* the *retail Price* of 8 *Hods :*

So is 100 to $412\frac{18}{81}$, which is $312\frac{18}{81}$ *per Cent.* Profit, and $287\frac{18}{81}$ *Fxaction*, above 25 *per Cent.* HONEST *Gain.*

AND ſince that I have before proved, *that the prime Coſt of the beſt ſort of Terrace Mortar* is but 13 *d. per* Hod, it therefore follows its Price *per* Hod retail, at 25 *per Cent.* Profit, is but 1 *s.* $4\frac{1}{4}$ *d.*

For as 100 is to 125, ſo is 13 *d.* the *prime Coſt per Hod*, to 1 *s.* $4\frac{1}{4}$ *d.* the *retail Price* aforeſaid.

BRICKLAYERS *alſo ſell Terrace dry, mixt with ſlacked Lime*, made ready for Beating, which muſt be done near to the Work where 'tis uſed, becauſe of its ſetting very quick; which it will always do if 'tis good and well beaten, and therefore muſt be inſtantly uſed in ſmall Quantities as 'tis beat.

IN *the beating of Terrace*, great Care ſhould be taken not to over-wet it, but to beat it as ſtiff as can be; and the oftner 'tis beat, the ſtronger it is.

The prime Coſt of good Terrace, mixt with ſlacked Lime, per *Buſhel ſtriked, is as follows*, viz.

To

To one Bushel of *Terrace* at	0	3	6
Add two Bushels striked of unslacked *Lime*	0	0	9
Total	0	4	3

Which is 1 *s.* 5 *d. per* Bushel *prime Cost*, and 1 *s.* 9¼ *d.* retail, at 25 *per Cent.* Profit.

FOR as 100 is to 125, so is 17 *d.* the prime Cost *per* Bushel, to 21*d.* 25; which is 1 *s.* 9¼ *per* Bushel.

N. B. IN this Computation there's nothing allowed for fetching the Terrace from *Fleet-Ditch*, nor of the Carriage of the Lime and Terrace from the Bricklayer's Dwelling to the Place of Work; which must be separately paid, as it may be worth, according to the Labourer's Time imploy'd therein.

IV. *Of* BRICK-DUST MORTAR.

THIS Kind of Mortar is *exceeding good*, and in some Cases is *better* than *Terrace Mortar*; for unless *Terrace Mortar* is always wet, 'tis not better than common Mortar made of Lime and Sand.

THIS Kind of Mortar is thus made, *viz.*

TO two heap'd Bushels of *hot Lime* put one heap'd Bushel of *Brick-dust* made from red *Stock Bricks*, which mix, beat, and work up, as before directed for *Terrace*.

THIS

THIS is an excellant Mortar for to lay *Foot Tiles*, or *ten Inch Tile Pavements* in, on Floors which are naturally wet or damp; and for Brick Pavement and Tiling, unleſs for *Glazed Tiles*, and then in the ſtead of *Brick-duſt* 'tis beſt to uſe *Sea-coal Aſhes*, with ſome *unburnt ſmall Sea-coal Duſt* mixt, in the ſtead of the *Brick-duſt*.

The prime Coſt of BRICK-DUST MORTAR *is as follows*, viz.

1 Heaped Buſhel of *Brick-duſt*	0	1	4
2 Heaped Buſhels of *Hot Lime*, ſay	0	0	10
Labour to *ſlack*, *ſift*, and *turn up*	0	0	3
Labourer $\frac{1}{2}$ Day to beat	0	1	1
Total	0	3	6

THESE 3 Buſhels of *Brick-duſt* and *Lime* will make 6 *Hods of Mortar*, which comes to 7 *d. per Hod* prime Coſt, and $8\frac{3}{4}$ *d. per Hod* retail, at 25 *per Cent.* HONEST *Gain.* For

As 100 is to 125, ſo is 7 *d.* the prime Coſt per Hod, to $8\frac{3}{4}$ *d.* which, to avoid the Trouble of Fractions in Computation, I allow at 9 *d.* per Hod.

V. *Of*

V. *Of* SEA-COAL MORTAR, *called* BASTARD TERRACE.

THIS is alſo an exceding good Mortar for to lay the *Coping of Walls* in, for to point *glazed Pan-tiling*, for to lay *Slating*, Purbeck *and* Portland *Pavement*, &c. in; and many other Uſes, where the Rains are required to be kept out.

This Mortar is thus made.

To 3 heap'd Pecks of a *Smith's Forge Sea-Coal Aſhes* (which is ſold for 4*d.* per heaped Buſhel) intermix'd with the *Iron Flakes*, put 1 heaped Peck of *unburnt Sea-coal Duſt*, and two heaped Buſhels of *hot ſlacked Lime*; which incorporate well by Beating, as before ſaid of *Terrace Mortar*, and uſe it up as 'tis beat.

The prime Coſt of SEA-COAL MORTAR *is as follows*, viz.

3 Pecks of *Aſhes*	0	0	3
1 Peck of *Sea-coal Duſt*, about	0	0	3
2 Buſhels of *Lime*	0	0	10
Labourer to *ſlack*, *ſift* and *beat*	0	1	2
Total	0	2	6

Which as theſe 3 Buſhels of Ingredients will make 6 large Hods of Mortar, the *prime*

Cost is 5 *d. per* Hod, and *retail Price* at 25 *per Cent.* Profit $6\frac{1}{4}$ *d.* For

As 100 is to 125, so is 5 *d.* to $6\frac{1}{4}$ *d.*

VI. *Of* PARGETTING MORTAR.

THIS Kind of Mortar is chiefly used for to plaister the *Insides of the Funnels of Chimneys*, and is also very good for to point common *Pan-Tiling*, &c. and is thus made:

To 1 heaped Bushel of fine skreened *clear Lime* add about a 4th Part of *fresh Horse-dung*, clear from Dirt and Straw; which incorporate with the Lime by well beating it, as is said of *Terrace Mortar*.

The prime Cost of this Mortar is as follows, viz.

1 Bushel of *fine Lime*, taken out of 2 Bushels of unskreened Lime	0	0	$4\frac{1}{2}$
Horse-Dung and Labour to get it	0	0	$1\frac{1}{2}$
Labour to *slack*, *sift*, *turn up* and *beat*	0	0	4
Total	0	0	10

THESE Ingredients will make two and a half Hods of Mortar, which comes to 4 *d. per Hod, prime Cost*, and 5 *d. per Hod retail*, at 25 *per Cent.* Profit: But *Bricklayers* retail it at 8 *d. per Hod*, which is 100 *per Cent.* Profit, or 75 *per Cent. Exaction*, above 25 *per Cent.* HONEST *Gain.*

VII. *Of*

VII. *Of* FURNACE *or* FIRE MORTAR.

THIS Mortar is made either of *Woolwich Loam*, or of *Windſor Loam*, *viz.* Loam brought from *Woolwich* in *Kent*, or from the Brick Kiln at *Jerrard's Croſs*, by way of *Windſor.*

BOTH theſe Kinds of *Loam* endure *very great Heats* before they will vitrify.

THE Manner of making them into *Mortar* is to *well chaff and beat them*, as outſide common Mortar is done, and of ſuch a Conſiſtency as to work eaſy.

THE *Woolwich* Loam is ſold by the *Load* (*viz.* 24 *heaped Buſhels* at 10*s.*) and the *Windſor Loam* by the Tun Weight, at 25*s.* excluſive of Carriage, at the *Fleet-Ditch* Side.

Of White PLAISTER MORTAR.

PLAISTER prepared (vulgarly called *Plaiſter of Paris*) when mixt with Water, becomes a *Mortar* or *Cement*, that ſets very ſoon and hard; and by *Bricklayers* is uſed for ſetting of *Galley Tiles* in the *Covings* of Chimneys, Cold Baths, Paſtrys, &c.

AND as common *Lime* is made of *Chalk calcined*, ſo *Plaiſter* is made of *Alabaſter-ſtone* or *Talk* calcined and pulverized; or firſt pulverized in the *Raw-ſtone*, and calcined afterwards in a Boiler.

To Calcine Alabaster-stone, and to make Plaister commonly called, Plaister of Paris.

BEAT *the Stones to Pieces*, about the Size of a Hen's Egg; then *burn or bake it*, until the *shining Quality* within each Piece (which is easily known by breaking some of them) be entirely gone, and they appear entirely white within like Chalk; then beat it on a flat *Purbeck* Stone, enclosed with a Frame, about 3 Feet square, and sift it through a fine *Wier* or *Lawn Sieve* into a Tub for Use.

To boil raw Plaister pulverized.

THE *raw Alabaster* being pulverized, &c. as aforesaid, and having an *Iron Boiler* fixed up in manner of a small *Washing Copper*, that will contain about 6, 8, &c. Gallons; fill it about half full, and having a good Fire under it, *keep it constantly stirring up from the Bottom* (where it will endeavour to coagulate or thicken) until the Humidity of the pulverized Stone is entirely evaporated, *when it will boil*, and may be stirred (which must be constantly done) with the same Ease as so much *Water*.

IN *the stirring of pulverized Plaister when boiling*, beware of its flying into the Face of him that stirs it, *which the rarified Air* within will often occasion.

WHEN

WHEN *the pulverized Stone will no longer boil*, but ſubſides, and becomes ſo heavy and compact, as not to be eaſily ſtir'd, *then 'tis done*, and muſt be taken out with an *Iron Ladle*, and put into *Tubs*, and when cold, into brown *Paper-Bags*, and *kept dry* and cloſe from the Air, for Uſe.

OLD *Plaiſter-Floors* or *Molds*, being dryed and pulverized, and boiled as aforeſaid, make a ſurprizing *ſtrong Mortar* for *Rockworks*, made with *Flints*, *Chalk*, *Scum-Iron*, *Clinkers*, &c. and will endure the Inclemency of *Rains*, *Froſts*, &c. for *many Years*, being uſed immediately after boiled: And tho' it will not *ſet ſo ſoon* as *new Plaiſter*, yet when 'tis ſet (which it will do in a few Hours Time) 'tis much *harder* than new Plaiſter.

☞ WHEN *new Plaiſter in Working ſets faſter than the Workman can uſe it*, he muſt uſe *Small Beer* inſtead of *Water*, which will cauſe it not only to be *ſlower in ſetting*, but to be much ſtronger and harder when ſet.

PLAISTER *prepared* as aforeſaid, *ſuffers very great Waſte* in the Boiling; at leaſt one fifth Part.

'TIS *ſold Wholeſale in the Stone* by the *Gainſborough Merchant-men*, who bring it as Ballaſt to *London*, at about 30 *s. per* Tun, delivered at any Part of the Town.

IT *is also sold wholesale*, ready calcin'd and pulverized, fit for common Use, at 8 *s.* *per Hundred* Weight.

BUT *Bricklayers retail it* in the Setting of *Chimney Tiles*, &c. at 2 *d. per Pound*; wherein they exact 108$\frac{1}{4}$ *per Cent.* above 25 *per Cent* Honest Gain. For

As 8 *s.* the prime Cost of 112 Pounds, is to 18 *s.* 8 *d.* the Amount at 2*d. per* Pound;

So is 100 to 233$\frac{1}{4}$: which is 133$\frac{1}{4}$ *per Cent.* and 108$\frac{1}{4}$ *Exaction* above 25 *per Cent.* HONEST *Gain.*

SECT. VI. *Of* LATHS *for Plain Tiling and Pan Tiling.*

I. *Of* LATHS *for Plain Tiling.*

THE *Laths* used for *plain Tiling*, should always be made of *good Heart of Oak*, and are therefore called *Heart Laths*: But too often when *Buildings* are *built for Sale*, the covetous Builder uses *Fir Laths*, as being cheaper, but are of very short Duration.

HEART LATHS are made of two different Lengths, *viz.* 4 Feet and 5 Feet, which are both made up and sold in Bundles.

A BUNDLE of 4 Feet Laths should contain 120 *Laths*, each 4 Feet in Length, making

480 Feet; and a *Bundle* of 5 Feet Laths ſhould contain 100 *Laths*, each 5 Feet in Length, making 500 Feet: *But* unleſs 'tis agreed on with the Seller, that every Bundle ſhall make the aforeſaid Meaſures, they ſeldom or ever will do ſo, *For what with the Shortneſs of Tale, and the Shortneſs of the Laths, Knaviſhly placed in the Middles of the Bundles*, they ſeldom or ever produce the Quantities for which they are ſold.

A HEART OAK LATH, by the *Statute Edw.* III. ſhould be 1 *Inch in Breadth and* $\frac{1}{2}$ *an Inch in Thickneſs:* But now, tho' their Breadth is an Inch according to the Statute, yet their Thickneſs is *ſeldom more than a Quarter of an Inch*; ſo that *two Laths*, as they are now uſually made, are but equal to one Lath according to the ſaid *Statute*.

THESE *Laths* are ſold wholeſale by Timber Merchants for 50 *s. per* Load, which is 1 *s.* 8 *d. per* Bundle.

N. B. A Load of $\left\{\begin{matrix}4\\5\end{matrix}\right\}$ Foot Laths is $\left\{\begin{matrix}37\frac{1}{2}\\30\end{matrix}\right\}$ Bundles.

N. B. BRICKLAYERS *retail Heart Laths* in Repairs, generally at 3 *s. per* Bundle; but the retail Price at 25 *per Cent.* Gain, is no more than 2 *s.* 1 *d.* For as 100 is to 125, ſo is 20 *d.* to 2 *s.* 1 *d.*

FIR or Deal Laths are about an Inch and Quarter in Breadth, and barely a Quarter of an Inch in Thickneſs.

THEY are made of divers Lengths, as 3, 4, 5 and 6 Feet: But all of them are reduced to the Standard Length of 5 Feet; and ſo every 150 Feet Run of Bundles (each Bundle containing 100 Laths) is a Load, as being equal to 30 Bundles of 5 Feet.

THESE Laths are ſold prime Coſt at 30 *s.* a Load, which is 1 *s. per* Bundle, and at retail Price of 25 *per Cent.* Gain, is 1 *s.* 3 *d. per* Bundle.

II. *Of* LATHS *for* PAN TILING.

PAN TILE LATHS ſhould be cut out of good yellow Deals, as being of greater Strength and Duration than white Deals.

THEY are generally made about 10 Feet in Length, or they are rather ſo called, for 'tis ſeldom that thoſe which are called 10 Feet will work more than 9 Feet; becauſe the Deals out of which they are cut, very rarely exceed that Length.

THE Thickneſs of a Pan Tile Lath ſhould be 1 Inch, and its Breadth 1 $\frac{1}{2}$ Inch, but they are ſeldom more than $\frac{3}{4}$ in Thickneſs.

THEY are ſold by Timber-Merchants made up in Bundles, each containing 12 Laths, at 1 *s.* 6 *d. per* Bundle; which Bricklayers, in Repairs,

pairs, frequently retail at 3 *d. per* Lath, and thereby have a Profit of 100 *per Cent.*

SECT. VII. *Of the Prices,* &c. *of such Kinds of* BRADS, *which are commonly used in the Repairs,* &c. *of Buildings.*

THE several Kinds of Nails called BRADS, are *Two-penny, Three-penny, Four-penny, Six-penny, Ten-penny,* and *Twenty-penny.*

I. *Of* TWO-PENNY BRADS.

THESE *Brads* being about *an Inch in Length,* are therefore called *Inch Brads,* and a Thousand *(viz.* 1200*)* weighs about 14 *Ounces.*

THE Price, prime Cost *per Thousand,* is 10*d.* which Workmen retail at 2 *d. per* 100, which is 2 *s. per* 1200 or Thousand, and thereby have 14 *d. per* Thousand Profit; which is 140 *per Cent.* For

As 10 *d.* the *prime Cost,* is to 24 *d.* their *retale Price,* so is 100 to 240; which is 140 *per Cent.* Profit, and 115 *per Cent.* Exaction, more than 25 *per Cent.* HONEST *Gain.*

N. B. THE *honest retail Price* of 2 *d.* Brads, at 25 *per Cent.* Profit, is 1 s. $0\frac{1}{2}$ d. per 1200; 0 s. $1\frac{1}{2}$ d. per 120.

II. *Of* THREE-PENNY BRADS.

THESE *Brads* being about $1\frac{1}{2}$ *Inch in Length*, are therefore called *Inch and Half Brads*; and a Thousand of them, *viz.* 1200, weighs about one Pound and 12 Ounces.

THE *prime Cost per Thousand* is 1 *s.* 4 *d.* which Workmen *retail at* 3 d. *per* 100, which is 3 *s. per Thousand*; and thereby have 1*s.* 8*d. per Thousand Profit*, which is 125 *per Cent.* For

As 16 *d.* the *prime Cost*, is to 36 *d.* their *retail Price*, so is 100 *l.* to 225; which is 125 *per Cent.* Profit, and 100 *per Cent. Exaction*, more than 25 *per Cent.* HONEST *Gain.*

N. B. THE *honest retail Price* of 3 *d.* Brads, at 25 *per Cent.* Profit, is 1 s. 8 d. per 1200; 0 s. 2 d. per 120.

III. *Of* FOUR-PENNY BRADS.

THESE *Brads* being about *two Inches in Length*, are therefore called *Two Inch Brads*; and a Thousand of them, *viz.* 1200, weighs about 2 Pounds and 12 Ounces.

THE

THE Price, *prime Cost*, is 1 *s.* 8 *d.* *per* Thousand, which Workmen retail at 4 *d.* *per* 100, which is 4 *s.* *per* Thousand Profit, and which is 140 *per Cent.* For

As 20 *d.* the *prime Cost*, is to 48 *d.* their *retail Price*, so is 100 *l.* to 240 *l.* which is 140 *per Cent.* Profit, and 115 *per Cent.* Exaction, more than 25 *per Cent.* HONEST Gain.

	s. d.		
N. B. THE *honest retail Price* of 4 *d.* Brads, at 25 *per Cent.* Profit, is	2 1	per	1200
	0 $2\frac{1}{2}$	per	120

IV. *Of* SIX-PENNY BRADS.

THESE *Brads* are about $2\frac{1}{4}$ Inches *in Length*, and a Thousand (*viz.* 1200 of them) weighs about 5 Pounds.

THE *prime Cost per* 1200, or Thousand, is 2 *s* 6 *d.* which Workmen *retail* at 6 *d.* *per* 100, which is 6 *s.* *per* Thousand of 1200, and thereby have 3 *s.* 6 *d.* *per* Thousand Profit, which is 140 *per Cent.* For

As 30 *d.* the prime Cost, is to 72 *d.* or 6 *s.* their retail Price, so is 100 *l.* to 240 *l.* which is 140 *per Cent.* Profit, and 115 *per Cent.* Exaction, above 25 *per Cent.* HONEST Gain.

N. B.

N. B. THE *honest retail Price* of 6 *d.* Brads, at 25 *per Cent.* Profit, is	*s. d.* 3 $1\frac{1}{2}$	per	1200
	$3\frac{3}{4}$		120

V. *Of* TEN-PENNY BRADS.

THESE Sort of *Brads* are about $2\frac{1}{2}$ Inches in Length, and a Thousand *(viz.* 1200*)* of them weighs about 13 Pounds and a Half.

THE Price, *prime Cost*, is 4 *s. per* Thousand; which some few Workmen have the *Modesty* to retail at 8 *d. per* 100, which is 8 *s. per* Thousand: But for the Generality, they are *retailed* at 10 *d. per* 100, which is 10 *s. per* Thousand.

THOSE Workmen who retail these Brads at 8 *d. per* 100 have 100 *per Cent.* Profit.

For as 4 *s.* the *prime Cost*, is to 8 *s.* their *retail Price*, per Thousand; so is 100 *l.* to 200 *l.* which is 100 *per Cent.* Profit, and 75 *per Cent.* Exaction, more than 25 *per Cent.* HONEST *Gain.*

BUT those Workmen who retail them at 10 *d. per* 100, have 150 *per Cent.* Profit. For

As 4 *s.* the *prime Cost* of 1200 Brads, is to 10 *s.* their *retail Price*; so is 100 *l.* to 250 *l.* which is 150 *per Cent.* Profit, and 125 *per Cent.* Exaction, more than 25 *per Cent.* HONEST *Gain.*

N. B.

N. B. THE *honest retail Price* of 10 *d.* Brads, at 25 *per Cent.* Profit, is	*s.* *d.*			
	5 0	per	1200	
	0 6		120	

VI. *Of* TWENTY-PENNY BRADS.

THERE are three Sorts of *Twenty-penny Brads*, viz. those of 17, of 20, and of 22 Pounds Weight *per* Thousand, *viz.* 1200 Brads.

			Inches	
Those of	17	Pounds Weight, are about	$2 \frac{7}{8}$	in Length:
	20		$3 \frac{1}{4}$	
	22		$3 \frac{1}{2}$	

			s. *d.*	
The prime Cost of those whose Weight is	17	Pounds, is	5 0	*per* Thousand, *viz.* 1200 Brads.
	20		5 8	
	22		6 2	

WHICH generally are retailed by some Workmen at 1 *s.* 4*d.* and by others at 1 *s.* 8*d.* *per* 100.

IN those of 17 Pounds Weight *per* Thousand, which are mostly used, as being the cheapest, the Workman who retails them at 1 *s.* 4*d.* *per* 100, has 220 *per Cent.* Profit. For

As 5 *s.* the *prime Cost* is to 16 *s.* the *retail Price* at 1 *s.* 4 *d.* *per* 100; so is 100 *l.* to 320 *l.* which is 220 *per Cent.* Profit, and

195

195 *per Cent.* Exaction, above 25 *per Cent.* Honest *Gain.*

And those Workmen who retail them at 1 *s.* 8 *d.* *per* 100 (which is frequently done) have 300 *per Cent.* Profit. For

As 5 *s.* the *prime Cost per* Thousand, is to 20 *s.* their *retail Price* at 1 *s.* 8 *d.* *per* 100; so is 100 *l.* to 400 *l.* which is 300 *per Cent.* Profit, and 275 *per Cent.* Exaction, more than 25 *per Cent.* Honest *Gain.*

N.B. The honest retail Price of 20 *Penny Brads*, which weigh	lb		*s.*	*d.*		*d.*	
	17	*per* Thous. is	6	3	*per* Thous. or	$7\frac{1}{2}$	*per* Hundred, or 120 *Brads.*
	20		7	1		$8\frac{1}{2}$	
	22		7	$8\frac{1}{2}$		$9\frac{1}{4}$	

Sect. VIII. *Of the Prices,* &c. *of such Kinds of* NAILS *as are commonly used in the Repairs,* &c. *of Buildings.*

THESE Kinds of Nails are *Rose-headed,* as *Two-penny, Three-penny,* and *Four-penny*;) and *Clasp-headed,* as *Six-penny, Ten-penny,* and *Twenty-penny.*

I. *Of* Two-penny *Rose-headed* Nails, 70 *Thousand per Bag.*

The *prime* Cost of these *Nails* is 1 *s.* 2 *d.* *per* 1200, which Workmen retail at 2 *d.* *per* 100, and which is 2 *s.* *per* Thousand, and

and is 71 $\frac{3}{7}$ *per Cent.* Profit. For as 14 *d.* the *prime* Coſt, is to 2 *s.* their *retail* Price; ſo is 100 *l.* to 171 *l.* $\frac{3}{7}$, which is 46$\frac{3}{7}$ Exaction, above 25 *per Cent.* HONEST *Gain.*

THESE *Nails* are about 7 *Eighths of an Inch in Length*, and a Thouſand (*viz.* 1200 of them) weighs about 2 Pounds.

N. *B.* THE *honeſt* retail Price *of* Two-penny Roſe-headed Nails, *at* 25 per Cent. Profit, *is* 1 s. 5$\frac{1}{2}$ d. per 1200, *or* 1$\frac{3}{4}$ d. per 120.

II. *Of* THREE-PENNY *Roſe-headed* NAILS, 48 *Thouſand per Bag.*

THE *prime* Coſt of theſe Nails is 1 *s.* 4 *d. per* Thouſand (*viz.* 1200) which Workmen retail at 3 *d. per* 100, and which is 3 *s. per* Thouſand, and 125 *per Cent.* Profit, For as 1 *s.* 4 *d.* the *prime* Coſt, is to 3 *s.* their *retail* Price; ſo is 100 *l.* to 225 *l.* which is 100 *per Cent.* Exaction, above 25 *per Cent.* HONEST *Gain.*

THESE *Nails* are of two Kinds, *viz.* Long and Short. The *long* 3 *Penny Nail* is about an Inch in Length, and the other ſomething ſhorter and thicker, ſo that a Thouſand of either Sort is about 2 Pounds and 14 Ounces Weight.

N. B. THE *honeſt* retail Price *of* Three-penny Roſe-headed Nails, *at* 25 per Cent. Profit,

Profit, *is* 1s. 8d. per 1200, *or* 2d. per 120 Nails.

III. *Of* FOUR-PENNY *Rose-headed* NAILS.

THE *prime* Cost of these *Nails* is 1*s.* 9*d.* *per* Thousand, which Workmen retail at 4*d.* *per* 100, and which is 128 *per Cent.* Profit. For as 21 Pence, the *prime* Cost, is to 48 Pence, their *retail* Price; so is 100*l.* to $228\frac{12}{21}$; which is $103\frac{12}{21}$ *per Cent.* Exaction, above 25 *per Cent.* HONEST *Gain.*

THESE *Nails* are also of two Lengths, and are therefore called *Short and Long Four-penny.*

THE *short Four-penny Nail* is about an Inch and $\frac{3}{8}$, and the *long Four-penny* about an Inch and $\frac{1}{4}$ in Length, and a Thousand of either Sort weighs about 3 Pounds 12 Ounces.

N.B. THE *honest* retail Price, *at* 25 per Cent. Profit, *is* 2s. $2\frac{1}{4}$d. per 1200, *or* $2\frac{1}{4}$ d. per 120 Nails.

IV. *Of* SIX-PENNY *Clasp-headed* NAILS, 20 *Thousand per Bag.*

THE *prime* Cost of these *Nails* is 2*s.* 6*d.* *per* Thousand, *viz.* 1200 Nails; which Workmen *retail* at 6*d.* *per* 100 Nails, or 6*s.* *per* Thousand, of 1200, and therein have 140 *per*

per Cent. Profit, *&c.* as before noted in the *Six-Penny Brads*, p. 55.

THE Length of a Six-penny Clasp-headed *Nail* is generally about 2 Inches, and a Thousand of them weighs about 7 Pounds.

N B. THE *honest* retail Price of Six-penny Clasp-headed *Nails* is 3 *s.* $1\frac{1}{2}$ *d.* *per* 1200, or $3\frac{3}{4}$ *d. per* 120 *Nails.*

V. *Of* TEN-PENNY *Clasp-headed* NAILS, 12 *Thousand per Bag.*

THE *prime* Cost of these *Nails* is 4 *s.* *per* Thousand, which Workmen *retail* at 8 *d.* *per* 100 *Nails*, the cheapest, and very often at 10 *d.* and thereby have the Profits of 100 and 150 *per Cent.* as before noted in the Profits of Ten-penny Brads, in p. 56.

N. B. THE *honest* retail Price of Clasp-headed *Ten-penny Nails*, at 25 *per Cent.* is 5 *s.* *per* Thousand, or 6 *d.* *per* 120 Nails.

N. B. THE Length of a *Ten-penny Nail* is about $2\frac{1}{8}$ Inches, and a Thousand of them weighs about 13 Pounds.

VI. *Of* TWENTY-PENNY *Clasp-headed* NAILS, 7 *Thousand per Bag.*

THE *prime* Cost of Twenty-penny Clasp-headed *Nails*, of about 20 Pounds *per* Thousand, is 6 *s.* which Workmen *retail* at 1 *s.* 4 *d.* the cheapest, but oftner at 1 *s.* 8 *d.* *per* 100 Nails, and thereby, in the 1*st* Case they have a Profit of $133\frac{2}{3}$, and in the *last*, of $233\frac{1}{3}$ *per Cent.* For, in the first Case,

As 6 *s.* the *prime* Cost, is to 16 *s.* their cheapest *retail* Price; so is 100 *l.* to $233\frac{2}{3}$, which is $133\frac{2}{3}$ per Cent. Profit, as abovesaid.

And in the second Case,

As 6 *s.* the *prime* Cost, is to 20 *s.* their *retail* Price; so is 100 *l.* to $333\frac{1}{3}$ *l.* which is $233\frac{1}{3}$ per Cent. Profit, as aforesaid.

N.B. THE Length of a *Twenty-penny Nail* of 20 Pounds to the Thousand, is about $3\frac{3}{8}$ Inches; and their *retail* Price, at 25 per Cent. *honest* Gain, is 7 *s.* 6 *d.* per 1200, or 9 *d.* *per* 120 *Nails.*

VII. *Of* TWO-SHILLING NAILS, HALF-CROWN NAILS, *and* SPIKES.

1. *Of* TWO-SHILLING NAILS.

THESE *Nails* are each about 4 Inches in Length, and about 1 Ounce in Weight.

And

And therefore,

$$\text{In}\left\{\begin{matrix}1\\112\end{matrix}\right\}\begin{matrix}\text{Pound, there}\\\text{is about}\end{matrix}\left\{\begin{matrix}16\\1792\end{matrix}\right\}\text{Nails.}$$

	l.	s.	d.
THEY are ſold *prime* Coſt at	1	12	0
per 112 Pounds, which is not quite	0	0	$3\frac{1}{2}$

per Pound, and nearly 1 Farthing *per Nail.*

NOW as 100*l.* is to 125*l.* ſo is 32 Shillings, the *prime* Coſt *per* hundred Weight, to 40 Shillings the *retail* Price *per* 112 Pounds at 25 *per Cent.* HONEST *Gain*, which being ſomething more than 4 *Pence Farthing per Pound*, I ſhall therefore, for any Quantity leſs than 112 Pounds, allow them at $4\frac{1}{2}$*d. per Pound*, and for which I think they are retailed by Workmen.

II. *Of* HALF CROWN NAILS.

THESE *Nails* are each about 5 Inches long, and about $1\frac{2}{5}$ of an Ounce in Weight.

And therefore,

$$\text{In}\left\{\begin{matrix}1\\112\end{matrix}\right\}\begin{matrix}\text{Pound}\\\text{there is}\end{matrix}\left\{\begin{matrix}11\frac{1}{7}\\1248\end{matrix}\right\}\text{Nails.}$$

THESE *Nails* are alſo ſold *prime* Coſt at 32 Shillings *per* 112 Pounds Weight, which is nearly $3\frac{1}{2}$*d. per Pound*, and $1\frac{2}{40}$ *of a Farthing per Nail.*

N. B. The *retail* Price, at 25 *per Cent.* Honest *Gain*, is 40 *s. per* 112 Pounds, or $4\frac{1}{2}$ *d. per* Pound, for any less Quantity.

III. *Of* Spikes.

The common first Size of *Spikes* are each about 6 Inches in Length, and about $2\frac{1}{5}$ of an Ounce Weight.

And therefore,

In 1 Pound there are 6 Nails and $\frac{2}{13}$ of a Nail, and in a Hundred of 112 Pounds Weight, 689 Nails: But as they differ a little in their Size and Weight, I shall therefore allow but 6 *Nails to a Pound*, and but 672 to a Hundred Weight.

The *prime* Cost of *Spikes* is 3 *d. per Pound*, or 28 *s. per Hundred* of 112 *Pounds*, which is a Halfpenny *per* Nail.

The *retail* Price at 25 *per Cent.* Profit, is 3 Pence 3 Farthings *per Pound:* But Workmen generally retail them at 4 Pence, and therein have $133\frac{1}{3}$ *per Cent.* Profit, which is $8\frac{1}{3}$ *Exaction*, above 25 *per Cent.* Honest *Gain*.

N. B. Spike Nails of greater Length and Weight, are in general sold by the Pound (or Hundred) Weight, at the above Prices.

Note also, That the Prices of *Clout-Nails*, *Hold-Fasts*, *Wood-Screws*, *Wall-Hooks*, *Tenter-Hooks*,

Hooks, *&c.* being properly the Materials of the Carpenter (as indeed are moſt of the preceding Kinds of *Brads* and *Nails*) I ſhall therefore forbear to ſpeak of their Prices, until I come to treat of the Materials, *&c.* in general, of that Trade in PART II.

SECT. IX. *Of* BULLOCKS-HAIR.

AS the *Bricklayer* has often an Occaſion to uſe *Hair* in ſome of his Works, I muſt therefore take Notice of its Prices, *prime* Coſt and *Retail*.

THIS Kind of Hair is ſold wet, by the Tanner, at 1 *s.* *per Buſhel* heaped; which the crafty Workman, after he has dried and thraſh'd it, and thereby cauſes every Buſhel to meaſure full two Buſhels, *retails* it at 1 *s.* 4 *d.* *per Buſhel*, and thereby gets 1 *s.* 8 *d.* in every Buſhel; which is 166 *per Cent.* Profit. For

As 1 *s.* the *prime* Coſt of a Buſhel of *wet Hair* from the Tanner, is to 2 *s.* 8 *d.* its *retail* Price, when dried and thraſh'd as aforeſaid; ſo is 100 *l.* to 266 *l.* which is 141 *per Cent. Exaction*, above 25 *per Cent.* HONEST *Gain.*

N.B. THE *retail* Price of *wet Hair*, at 25 *per Cent.* Profit, is 1 *s.* 3 *d.* and of dried and thraſhed Hair, 8 *d.* *per* Buſhel heaped, excluſive of Carriage.

A SUMMARY *of the various Prices of Bricklayers Materials, and the Exactions therein.*

I. *Of* PLACE BRICKS. p. 2.

	l.	s.	d.
PRime cost *per Thousand*	0	14	0
Retail Pr. at 25 *per Cent.* Profit	0	17	6
Retail Price by *Bricklayers*	1	5	0
Exaction *per Thousand*	0	7	6

II. *Of the common Sort of Grey* STOCK BRICKS. p. 5.

Prime Cost *per Thousand*	0	18	0
Retail Price at 25 *per Cent.* Profit	1	2	6
Retail Price by *Bricklayers*	1	17	6
Exaction *per Thousand*	0	15	0

III. *Of the best-coloured Grey* STOCK BRICKS. p. 11.

Prime Cost *per Thousand*	1	2	0
Retail Price at 25 *per Cent.* Profit	1	7	6
Retail Price by *Bricklayers*	2	0	0
Exaction *per Thousand*	0	12	6

IV. *Of Red* STOCK *and* PAVING BRICKS. p. 12.

Prime Cost *per Thousand*	1	10	0
Retail Price at 25 *per Cent.* Profit	1	17	6
Retail Price by *Bricklayers*	2	0	0
Exaction *per Thousand*	0	2	6

V. *Of* WINDSOR BRICKS. p. 14.

Prime Cost *per Thousand*, and fetch them from *Fleet-Ditch*	3	0	0
Retailed at *honest Gain* per Thousand, and fetch them	3	15	0

VI. Of

VI. *Of* Plain Tiles. p. 16.

	l.	s.	d.
Prime Coſt *per Thouſand*	1	0	0
Retail Price at 25 *per Cent.* Profit	1	5	0
Retail Price by *Bricklayers*	1	10	0
Exaction *per Thouſand*	0	5	0

VII. *Of* Ridge *and* Pan Tiles. p. 18.

Prime Coſt *per Hundred*	0	6	0
Retail Price at 25 *per Cent.* Profit	0	7	6
Retail Price by *Bricklayers*	0	12	6
Exaction *per Hundred*	0	5	0

VIII. *Of* Glazed Pan Tiles. p. 18, 19.

Prime Coſt *per Hundred*	0	12	0
Retail Price at 25 *per Cent.* Profit	0	15	0
Retailed *per Hundred* by *Bricklayers*	0	16	8
Exaction *per Hundred*	0	1	8

IX. *Of* Foot Paving Tiles. p. 23.

Prime Coſt *per Hundred*	1	0	0
Retailed at 25 *per Cent.* Profit	1	5	0
Retail'd by *Bricklayers* per Hundred	1	13	4
Exaction *per Hundred.*	0	8	4

X. *Of* Ten Inch Paving Tiles. p. 23.

Prime Coſt *per Hundred*	0	8	0
Retail Price at 25 *per Cent.* Profit	0	10	0
Retail'd by *Bricklayers*	0	16	8
Exaction *per Hundred*	0	6	8

XI. *Of* DUTCH WHITE GALLY TILES *for Chimney-coves, &c.* p. 25, *&c.*

	l.	*s.*	*d.*
Prime Cost *per Tile*	0	0	2
Retail Price at 25 *per Cent.* Profit	0	0	$2\frac{1}{2}$

XII. *Of* DUTCH MARBLED GALLY TILES. p. 25.

Prime Cost *per Tile*	0	0	3
Retail Price at 25 *per Cent.* Profit	0	0	$3\frac{1}{4}$

XIII. *Of* PAINTED GALLY TILES, *the 2d best Sort.* p. 25.

Prime Cost *per Tile*	0	0	$3\frac{1}{2}$
Retail Price at 25 *per Cent.* Profit	0	0	$4\frac{1}{2}$

XIV. *Of* PAINTED GALLY TILES, *the 1st best Sort.* p. 25.

Prime Cost *per Tile*	0	0	4
Retailed at 25 *per Cent.* Profit	0	0	5

XV. *Of* UNSLACKED LIME *per Hundred.* p. 26.

Prime Cost *per Hundred*	0	9	0
Retail Price at 25 *per Cent.* Profit	0	11	3
Retailed by *Bricklayers* per Hund.	0	12	6
Exaction *per Hundred*	0	1	3

XVI. *Of* UNSLACKED LIME *per striked Bush.* p. 30.

Prime Cost *per Bushel*	0	0	$4\frac{1}{2}$
Retail at 25 *per Cent.*	0	0	$5\frac{1}{2}$

Retailed

	l.	*s.*	*d.*
Retailed by *Bricklayers*	0	0	6
Exaction *per Bushel*	0	0	$0\frac{1}{2}$

XVII. *Of* SLACKED LIME *per striked Bushel.* p. 31.

Prime Cost	0	0	4
Retail at 25 *per Cent.*	0	0	5
Retail Price by *Bricklayers*	0	0	6
Exaction *per Bushel*	0	0	1

XVIII. *Of* INSIDE MORTAR. p. 39.

Prime Cost *per Hod*	0	0	$1\frac{3}{4}\ \frac{2}{10}$
Retailed at 25 *per Cent.* Profit	0	0	$2\frac{1}{2}$
Retailed by *Bricklayers* at	0	0	4
Exaction *per Hod*	0	0	$1\frac{1}{2}$

XIX. *Of* OUTSIDE MORTAR. p. 39.

Prime Cost *per Hod*	0	0	$2\frac{1}{4}$
Retail at	0	0	3
Retailed by *Bricklayers* at	0	0	6
Exaction *per Hod*	0	0	3

XX. *Of* TERRACE MORTAR. p. 12.

Prime Cost *per Hod*	0	1	1
Retail at *honest Gain*	0	1	$4\frac{1}{4}$
Retailed by *Bricklayers* per Hod	0	3	6
Exaction *per Hod*	0	2	$1\frac{3}{4}$

XXI. *Of Dry* TERRACE *and* LIME *mixt, ready for beating.* p. 42.

	l.	*s.*	*d.*
Prime Cost *per striked Bushel*	0	1	5
Retail at *honest Gain*	0	1	$9\frac{1}{4}$

Carriage excepted.

XXII. *Of* SEA-COAL ASH-MORTAR, *made of Forge-Ashes and Lime.* p. 45.

Prime Cost *per Hod*	0	0	5
Retailed at *Honest Gain*	0	0	$6\frac{1}{4}$

XXIII. *Of* BRICK-DUST MORTAR. p. 44.

Prime Cost *per Hod*	0	0	7
Retailed at *honest Gain*	0	0	$8\frac{1}{4}$

XXIV. *Of* PARGETTING MORTAR. p. 46.

Prime Cost *per Hod*	0	0	4
Retailed at *honest Gain*	0	0	5
Retailed by *Bricklayers* per Hod	0	0	8
Exaction *per Hod*	0	0	3

XXV. *Of Raw white* PLAISTER-STONE. p. 49.

Prime Cost *per Tun*	1	10	0
Retailed at *honest Gain*	1	17	6

XXVI. *Of White* PLAISTER *prepared for Use, the common Sort.* p. 59.

Prime Cost *per Pound*	0	0	1
Retailed at *honest Gain*, allowing for Waste	0	0	$1\frac{1}{2}$

Retailed

	l.	s.	d.
Retailed by *Bricklayers per Pound*	0	0	2
Exaction *per Pound*	0	0	$0\frac{1}{2}$

XXVII. *Of* WINDSOR LOAM MORTAR. p. 47.

Prime Cost *per Tun weight*, and fetch it from *Fleet-Ditch*	1	5	0
Retailed at *honest Gain per Tun*, and fetch it	1	10	3

N.B. ONE *Tun* will make 40 large Hods of Mortar.

XXVIII. *Of* OAK HEART LATHS. p. 51.

Prime Cost *per Bundle*, by the Load	0	1	8
Retail Price at 25 *per Cent.* Profit	0	2	1
Retailed by *Bricklayers*	0	3	0
Exaction *per Bundle*	0	0	11

XXIX. OAK SAP LATHS.

Prime Cost *per Bundle*	0	1	0
Retail Price at 25 *per Cent.* Gain	0	1	3

XXX. *Of* DEAL LATHS. p. 51.

Prime Cost *per Bundle*, by the Load	0	1	0
Retail Price at 25 *per Cent.* Gain	0	1	3

XXXI. *Of* PAN-TILE LATHS, 10 *Feet.* p. 52.

Prime Cost *per Bundle* or Dozen	0	1	6
Retail Price at 25 *per Cent.* Gain	0	1	$10\frac{1}{2}$

Or $7\frac{2}{10}$ Farthing *per Lath.*

XXXII. *Of Inch or* TWO-PENNY BRADS, *Weight about* 14 *Ounces* per Thousand. p. 53.

		s.	d.	q.
Prime Cost per	Thousand or 1200,	0	10	
	100	0	0	$3\frac{1}{3}$
Retail Price at 25 *per Cent.* Gain, *per*	Thousand or 1200,	1	$0\frac{1}{2}$	
	100	0	$1\frac{1}{6}$	
Retail Price by Bricklayers, *&c.* *per*	Thousand or 1200,	2	0	
	100	0	2	
Exaction *per*	1200	0	$11\frac{1}{2}$	
	100	0	$3\frac{5}{6}$	

XXXIII. *Of Inch and Half, or* THREE-PENNY BRADS, Weight *about* 1 *Pound* 12 *Ounces* per *Thousand.* p. 54.

		s.	d.	q.
Prime Cost *per*	Thousand or 1200,	1	4	
	100	0	1	$1\frac{1}{3}$
Retail Price at 25 *per Cent.* Gain, *per*	Thousand or 1200,	1	8	
	100	0	1	$2\frac{2}{3}$
Retail Price by Bricklayers, *&c.* *per*	Thousand. or 1200,	3	0	
	100	0	3	

Exaction

		s.	d.	q.
Exaction, *per*	1200	1	4	
	100	0	1	

XXXIV. *Of Two Inch or* FOUR-PENNY BRADS, *Weight about* 2 *Pounds* 12 *Ounces.* Page 54.

		s.	d.	q.
Prime Cost *per*	Thousand, or 1200	1	8	
	100	0	1	$2\frac{2}{3}$
Retail Price, at 25 *per Cent.* Gain, *per*	Thousand, or 1200	2	1	
	100	0	2	$0\frac{1}{3}$
Retail Price by Bricklayers, *&c.* *per*	Thousand, or 1200	4	0	
	100	0	4	
Exaction, *per*	1200	1	11	
	100	0	1	$3\frac{2}{3}$

XXXV. *Of* SIX-PENNY BRADS, *Weight about* 5 *Pounds* per *Thousand, and Length* $2\frac{1}{4}$ *Inches.* Page 55.

		s.	d.	q.
Prime Cost *per*	Thousand, or 1200	2	6	
	100	0	$2\frac{1}{2}$	
Retail Price, at 25 *per Cent.* Gain, *per*	Thousand, or 1200	3	$1\frac{1}{2}$	
	100	0	3	$0\frac{1}{2}$

Retail

		s.	d.	q.
Retail Price by Bricklayers, *&c.* *per*	Thousand, or 1200	6	0	
	100	0	6	
Exaction *per*	1200	2	$10\frac{1}{2}$	
	100	0	2	$3\frac{1}{2}$

XXXVI. *Of* TEN-PENNY BRADS, *Weight about* $13\frac{1}{2}$ *Pounds* per *Thousand, and Length about* $2\frac{1}{2}$ *Inches.* Page 56.

		s.	d.
Prime Cost *per*	Thousand, or 1200	4	0
	100	0	4
Retail Price, at 25 *per Cent.* Gain, *per*	Thousand, or 1200	5	0
	100	0	5
Retail Price by Workmen, *per*	Thousand, or 1200	8	0
	100	0	8

And very often,

		s.	d.
The Retail Price by Workmen, *per*	Thousand, or 1200	10	0
	100	0	10

So that

		s.	d.
The Exaction in the first Case is, *per*	1200	3	0
	100	0	3

And

And

		s.	d.
The Exaction in the last Case is, *per*	1200	5	0
	100	0	5

XXXVII. *Of* TWENTY-PENNY FLOORING BRADS, *Weight about* 17 *Pounds* per *Thousand, Length* $2\frac{1}{8}$ *Inches.* Page 57.

		l.	s.	d.
Prime Cost *per*	Thousand, or 1200		5	0
	100		0	5
Retail Price at 25 *per Cent.* Gain, *per*	Thousand, or 1200		6	3
	100		0	$6\frac{1}{4}$
Retail Price by Workmen, *per*	Thousand, or 1200		16	0
	100		1	4

And very often

		l.	s.	d.
The Retail Price by Workmen *per*	Thousand, or 1200	1	0	0
	100	0	1	8

So that

		l.	s.	d.
The Exaction in the first Case is *per*	1200	0	9	9
	100	0	0	$9\frac{1}{4}$

And

		l.	s.	d.
The Exaction in the last Case is *per*	1200	0	13	9
	100	0	1	$1\frac{1}{4}$

XXXVIII. *Of* Two-Penny *Rose-headed* Nails, *Weight about* 2 *Pounds* per *Thousand, Length* $\frac{7}{8}$ *of an Inch.* Page 58.

		s.	d.	q.
Prime Cost, *per*	Thousand, or 1200	1	2	0
	100 Nails	0	1	$0\frac{1}{6}$
Retail Price, at 25 *per Cent.* Gain, *per*	Thousand, or 1200	1	5	2
	100	0	1	$1\frac{2}{6}$
Retail Price by Bricklayers, *per*	Thousand, or 1200	2	0	
	100	0	2	
Exaction *per*	1200	0	6	2
	100	0	0	$2\frac{1}{6}$

XXXIX. *Of* Three-Penny *Rose-headed* Nails, *Weight* 2 *Pound* 14 *Ounces, Length about an Inch.* Page 59.

		s.	d.	q.
Prime Cost *per*	Thousand, or 1200	1	4	
	100	0	1	$1\frac{1}{3}$
Retail Price at 25 *per Cent.* Gain, *per*	Thousand, or 1200	1	8	
	100	0	1	$2\frac{2}{3}$

Retail

		s.	d.	q.
Retail Price by Bricklayers, *per*	Thousand, or 1200	3	0	
	100	0	3	
Exaction *per*	1200	1	4	
	100	0	1	$1\frac{1}{3}$

XL. *Of* FOUR-PENNY *Rose-headed* NAILS, *Weight about* 3 *Pound* 2 *Ounces* per *Thousand, and Length about* $1\frac{1}{8}$ *of an Inch.* Page 60.

		s.	d.	q.
Prime Cost *per*	Thousand, or 1200	1	9	
	100	0	$1\frac{3}{4}$	
Retail Price at 25 *per Cent.* Gain, *per*	Thousand, or 1200	2	$2\frac{1}{4}$	
	100	0	2	$0\frac{3}{4}$
Retail Price by Bricklayers, *per*	Thousand, or 1200	4	0	
	100	0	4	
Exaction *per*	1200	1	$9\frac{3}{4}$	
	100	0	1	$3\frac{1}{12}$

XLI. *Of* SIX-PENNY *Clasp-headed* NAILS, *Weight about* 7 *Pounds* per *Thousand, and Length* 2 *Inches.* Page 60.

		s.	d.
Prime Cost *per*	Thousand, or 1200	2	6
	100	0	$2\frac{1}{2}$

Retail

3

		s.	d.	q.
Retail Price at 25 *per Cent*. Gain, *per*	Thousand, or 1200	3	1	2
	100	0	3	$0\frac{1}{2}$
Retail Price by Bricklayers, *per*	Thousand, or 1200	6	0	
	100	0	6	
Exaction *per*	1200	2	11	
	100	0	2	$3\frac{2}{3}$

XLII. *Of* TEN-PENNY *Clasp-headed* NAILS, *Weight about* 13 *Pounds* per *Thousand*, *Length about* 2 *Inches* $\frac{1}{8}$. Page 61.

		s.	d.
Prime Cost *per*	Thousand, or 1200	4	0
	100	0	4
Retail Price at 25 *per Cent*. Profit *per*	Thousand or 1200	5	0
	100	0	5
Retail Price by Bricklayers, *&c.* the lowest, *per*	Thousand or 1200	8	0
	100	0	8
But more often *per*	Thousand or 1200	10	0
	100	0	10

So that at 8 *d.* *per* Hundred Nails,

	s.	*d.*	
The Exaction is	3	0	*per* 1200.
	0	3	*per* 100 Nails.

And at 10 *d.* *per* 100 Nails,

The Exaction is	5	0	*per* 1200.
	0	5	*per* 100 Nails.

XLIII. *Of* Twenty-penny *Clasp-headed* Nails, 20 *Pounds Weight* per *Thousand, and Length about* 3 *Inches* $\frac{1}{8}$. p. 62.

		l.	*s.*	*d.*
Prime Cost *per*	Thousand		6	0
	or 1200			
	100		0	6
Retail Price at 25 *per Cent.* Gain *per*	Thousand		7	6
	or 1200			
	100		0	$7\frac{1}{2}$
Retail Price by Workmen *per*	Thousand		16	0
	or 1200			
	100		1	4
But more often *per*	Thousand	1	0	0
	or 1200			
	100	0	1	8

So that at 1 *s.* 4 *d.* *per* 100 Nails,

The Exaction is	8 *s.* 6 *d.*	*per* 1200.
	0 $8\frac{1}{2}$	*per* 100.

And at 1 *s.* 8 *d. per* 100 Nails,

The Exaction is	12	6	*per* 1200.
	1	$0\frac{1}{2}$	*per* 100 Nails.

Above 25 *per Cent.* Honest Gain.

XLIV. *Of* TWO-SHILLING NAILS. *Length* 4 *Inches*, *Numb.* per *Pound*, 16 *Nails.* p. 62.

	l.	*s.*	*d.*
Prime Cost *per* Pound	0	0	$3\frac{1}{2}$
——— *per* Hundred Weight	1	12	0
Retail at 25 *per Cent.* Profit *per* Hundred Weight	2	0	0
—— *per* Pound	0	0	$4\frac{1}{2}$

XLV. *Of* HALF CROWN NAILS, *Length* 5 *Inches*, *Number* per *Pound* 11 *Nails.* p. 63.

	l.	*s.*	*d.*
Prime Cost *per* Pound	0	0	$3\frac{1}{2}$
——— Hundred Weight	1	12	0
Retail at 25 *per Cent.* Profit *per* Hundred Weight	2	0	0
—— *per* Pound	0	0	$4\frac{1}{2}$

XLVI. *Of* SPIKES, *Length* 6 *Inches*, *Number* per *Pound* 6 *Nails.* p. 64.

	l.	*s.*	*d.*
Prime Cost *per* Pound	0	0	3
——— *per* Hundred	1	8	0
Retail at 25 *per Cent.* Profit *per* Hundred	1	15	0
—— *per* Pound	0	0	$3\frac{1}{4}$

XLVII. *Of* BULLOCKS HAIR. p. 65.

Prime Coſt 1 *s.* *per* Buſhel, wet and heaped; which when dried and thraſhed, makes 2 Buſhels heaped.

	s.	d.
Retail Price at 25 *per Cent.* Profit *per* Buſhel, wet	1	3
Ditto, dried and thraſhed	0	8
Retail Price by Bricklayers, dried and thraſhed, *per* Buſhel	1	4
Exaction *per* Buſhel when dried and thraſhed	0	8

CHAP. II.

Of the KINDS *and* PRICES *of* BRICKLAYERS WORKS.

BRICKLAYERS WORKS are of divers Kinds, *viz. Firſt*, Common rough PLACE-BRICK *Walling unjointed*, as *Sewers*, *Drains*, *Foundations*, *Partition* and *Party-Walls*, *&c.* whoſe Surfaces are to be covered with Rendering, Wainſcot, *&c.*

Secondly, Common PLACE-BRICK Walling *jointed*; as Garden Walls, Backs of Out-Offices, Fronts of ordinary Houſes, *&c.*

 Thirdly,

Thirdly, Common *Front Walling*, faced with GREY STOCKS, with common (and with tuck-and-pat) Joints.

Fourthly, Court Walls, faced on both Sides with *Grey Stocks*, with common (and with tuck-and-pat) Joints.

Fifthly, Fronts faced with *rubbed Red Stocks*, with common (and with tuck-and-pat) Joints.

Sixthly, Party Walls, between Courts, *&c.* faced on both Sides with *rubbed Red Stock Bricks*; with common (and with tuck-and-pat) Joints.

Seventhly, Fronts entirely of *rubbed and gauged Red Stock Bricks*, ſet in Putty.

Eighthly, Walling done in *Terrace Mortar*, for Defence againſt Waters, *&c.*

Ninthly, Erect, circular and elliptical Walling of *grey Stocks*, or *red Stocks*, rubbed only, or rubbed and gauged; as *cylindrical Stair-Caſes*, *circular Colonades*, *Dado's* of *circular Pedeſtals*, *Piers* of *Gates*, *Shafts* of *Columns*, *Bodies* and *Heads* of *Niches*, &c.

Tenthly, Horizontal, circular and elliptical *Arches* for *Bridges*, *Groins* to *Rooms*, *Paſſages*, &c.

Eleventhly,

Eleventhly, Spherical and ſpheroidical *Domes*, *Cones*, and *Fruſtums* of *Cones* and *Pyramids* for *Spires* to Church Steeples, *Obeliſks*, &c.

Twelfthly, Rubbed and gauged *flat Ornaments*, as *Arches* to Windows, *Faſcias*, *Returns*, *Ruſticks* and *Ruſtick Quoins*, *Frizes*, *Shafts* of Pillaſters, *Dado's* of Pedeſtals, *Pannels*, *Bodies* of Piers to Gates, *&c.*

To theſe *Twelve Kinds of Brick-Works* muſt be added the different Kinds of Pavements, with Bricks and Tiles, and the Coverings with Plain and Pan Tiles; which, with the Repairs of Walling and Tiling, are the principal Works of a Bricklayer.

SECT. I. *Of the Price of common, rough, unjointed, Place-Brick Walling, entirely of Place-Bricks, as Foundations, Party-Walls*, &c.

IN this Kind of Brickwork, a *Bricklayer and a Labourer can lay* 1500 *Bricks per Day* (and not over-heat themſelves) which I have often experienced, and who therefore have performed one *Rod* of ſuch Work (which is 272 ſuperficial Feet of 1 Brick and a Half in Thickneſs) in *three Days*. For 4500, the Number of Bricks allowed for 1 *Rod* of this Kind of Work, being divided by 1500, the Number of Bricks frequently laid *per Day*, the Quotient 3, is the Number of Days.

Now, as I have already declared in p. 35, that 25 *heaped Bushels* of unslacked *Lime*, and as many *heaped Bushels* of *Sand*, are sufficient for one *Rod* of this Kind of Brick-work, *it is very easy to find the prime Cost per Rod*, either of *Materials* and *Labour*, or *Labour* only, in every Part of the Kingdom, where the Prices of Workmens Labour, and *prime Costs* of *Bricks*, *Lime*, and *Sand* is known, and from thence to find the *real Value* which the *Master* ought to be paid.

As for EXAMPLE,

IN and about LONDON, *Place Bricks* are delivered at 14 *s. per Thousand*, *Lime* at 9 *s. per Hundred*, *Sand* at 3 *s. per Load*; *Bricklayers* at 3 *s.* and their *Labourers* at 2 *s. per Day*. Therefore,

	l.	*s.*	*d.*
4500 Place Bricks at 14 *s. per* Thousand, is	3	3	0
25 heaped Bushels of unslacked Lime, which is equal to 28 Bags or Bushels striked, at 4½ *d. per* Bag, is	0	10	10
25 Bushels of Sand at 1½ *d.* is	0	3	1½
A Labourer ¾ of a Day to slack and skreen the Lime, and to turn up and chaff the Mortar, at 2 *s.* a Day, is	0	1	6
One Bricklayer 3 Days, is	0	9	0
One Labourer 3 Days, is	0	6	0
Total	4	13	5½

Which

Which is 3 *l.* 16 *s.* $9\frac{1}{2}$ *d. per Rod* for Materials, and 16 *s.* 6 *d.* for Labour.

Now if the *Master* be allowed $12\frac{1}{2}$ *per Cent. Profit* on his *Materials*, and 25 *per Cent. Profit* on his *Workmens Labour*, which for his Time and Trouble to attend and direct Workmen, *he well deserves*; then he must be paid

	l.	*s.*	*d.*	*q.*
For his Materials *per Rod*	4	5	4	3
And for Workmanship	1	0	7	2
Which together make	5	6	0	1

And which, to avoid the Trouble of Fractions, may be allowed at 5 *l.* 6 *s. per Rod*, wherein he has 12 *s.* 8 *d.* 3 *q.* Profit.

When *Gentlemen* find their own *Bricks*, and the *Bricklayer* finds *Mortar* and *Labour*, the *prime Cost* to the Bricklayer for Mortar, *per Rod*, is as follows, *viz.*

	l.	*s.*	*d.*
For 25 heaped Bushels of unslacked Lime	0	10	10
For 25 heaped Bushels of Sand	0	3	$1\frac{1}{2}$
For a Labourer $\frac{1}{4}$ Day, to *slack*, *skreen*, *turn up*, and *chaff*,	0	1	6
Total *prime Cost per Rod* for Mortar	0	15	$5\frac{1}{2}$

Which I allow at 16 *s.* and for which the Master, at $12\frac{1}{2}$ *per Cent.* Profit, must be paid 18 Shillings. And therefore,

	l.	s.	d.
If to — — —	0	18	0
Be added for Workmanſhip, with 25 *per Cent.* Profit, as before, *viz.*	1	0	$7\frac{1}{2}$
The Total	1	18	$07\frac{1}{2}$

Is the Maſter's Price *per Rod*, for Mortar and Workmanſhip, wherein he has 6 *s.* $7\frac{1}{2}$ *d.* Profit.

BUT when *Gentlemen* find their own *Bricks*, *Lime* and *Sand*, then the Maſter's Demand for Workmanſhip, with 25 *per Cent.* Profit, as aforeſaid, is but 1 *l.* 0 *s.* $7\frac{1}{2}$ *d.* But with regard to his not having Profit in the Materials, it muſt be made up 1 *l.* 1 *s.* and then he has 4 *s.* 6 *d.* Profit (which is 30 *per Cent.* and Gentlemen ſave 6 *s.*) *per Rod.*

	l.	s.	d.
For, if to the Prime Coſt of 4500 Bricks, at 14 *s.* *per* Thouſand,	3	3	0
Be added for Mortar	0	16	0
And for Workmanſhip	1	1	0
The Total is	5	0	0

Which is 6 *s.* leſs than 5 *l.* 6 *s.* the *real Value per Rod* to the Bricklayer, when he finds all Materials and Workmanſhip.

NOW from the Preceding 'tis evident, That in every Country, if to the prime Coſts of 4500 Bricks; of 25 heaped Buſhels of unſlacked

ſlacked Lime; of 25 heaped Buſhels of Sand, be added, the Wages of a Labourer $\frac{1}{4}$ of a Day, to *ſlack and ſkreen the Lime*, and to *turn up and chaff the Mortar*, fit for Uſe; and the Wages of a Bricklayer, and of a Labourer, for 3 Days, to lay the Bricks, the Total will be the prime Coſt *per Rod*; to which the preceding Profits being added, as aforeſaid, the Total will be the *honeſt Value per Rod* in each Country.

SECT. II. *Of the Price of common Place-Brick Walling, jointed; as Garden-Walls, Out-Offices, Carcaſſes of Ordinary Houſes, Barns,* &c.

IN *this Kind of Brick-work*, there is more Care required in the laying of Bricks, and conſequently more Time is employed than is in *rough Walling*; and beſides, here is alſo Time expended in Scaffolding, which in Foundations is but little, and Jointing not any: So that to lay a Thouſand of Bricks *per* Day, one Day with the other, is a reaſonable Day's Work for a Bricklayer and a Labourer: and which every HONEST *Journeyman* will not fail to do.

THE Number of Bricks *per* Rod are, in this Kind of Work, nearly the ſame as in rough Walling; but the Quantity of Lime here

here is more, and the Quantity of Sand is leſs; becauſe here, to have good Mortar, the Lime to the Sand ſhould be, as 2 is to 1, *viz.* To two heaped Buſhels of unſlacked Lime, put one heaped Buſhel of ſharp Sand; or otherwiſe, to every 41¼ ſtriked Buſhels, or Bags of unſlacked Lime, which are equal to 33½ heaped Buſhels, put 16½ heaped Buſhels of Sand; which together, as I have obſerved in Page 35, is ſufficient for a Rod of this Kind of Work. And therefore,

The prime Coſt of a Rod is as follows, *viz.*

	l.	*s.*	*d.*
4500 of Place Bricks, at 14 *s. per* Thouſand	3	3	0
41¼ Bags of Lime, at 9 *s. per* Hundred	0	15	0
16½ Heaped Buſhels of Sand, at 1 *d.* ½ *per* Buſhel	0	2	0¼
A Labourer ¾ of a Day, to *ſlack*, *ſkreen*, *turn up* and *chaff*	0	1	6
A Bricklayer 4 Days and ½, to lay the Bricks	0	13	6
A Labourer to ditto	0	9	0
Total prime Coſt	5	4	0¼

Now, if the Maſter be allowed 12½ *per Cent.* Profit on his Materials, and 25 *per Cent.* on his Workmanſhip, then the real Value *per* Rod is as follows, *viz.*

First,

First, *Of* MATERIALS.

	l.	s.	d.
For 4500 Bricks, prime Coſt	3	3	0
For $41\frac{1}{4}$ Bags of Lime	0	15	0
For $16\frac{1}{2}$ Buſhels of Sand	0	2	$0\frac{1}{4}$
Sum	4	0	$0\frac{1}{2}$
Profit admitted thereon at $12\frac{1}{2}$ *per Cent.*	0	10	0
Total Value *per* Rod of Materials	4	10	$0\frac{1}{4}$

Secondly, *Of* WORKMANSHIP.

	l.	s.	d.
One Labourer $\frac{3}{4}$ Day, to *ſlack, ſkreen, turn up* and *chaff*	0	1	6
One Bricklayer 4 Days and $\frac{1}{2}$ to lay Bricks	0	13	6
One Labourer 4 Days and $\frac{1}{2}$ to ditto	0	9	0
Prime Coſt of Labour	1	4	0
Profit admitted thereof at 25 *per Cent.*	0	6	0
Total Value *per* Rod of Workmanſhip	1	10	0

Now, if to 4 *l.* 10 *s.* $0\frac{1}{4}$ *d.* the total Value of Materials, be added 1 *l.* 10 *s.* the total Value of Workmanſhip, the Sum 6 *l.* 0 *s.* $0\frac{1}{4}$ *d.* is the real Value *per* Rod to the Workman, for his Materials and Labour; unleſs in lofty Buildings,

Buildings, where much Scaffolding is used, and then 'tis worth 6 *l.* 6 *s.* *per* Rod.

BUT when *Gentlemen* find their *own Bricks*, and the Bricklayer finds Mortar (made as aforesaid) and Labour, then the *prime Cost to the Bricklayer* for *Mortar per Rod*, is as follows, *viz.*

	l.	*s.*	*d.*
For $41\frac{1}{4}$ Bags of Lime	0	15	0
For $16\frac{1}{2}$ Bushels of Sand	0	2	$0\frac{1}{4}$
For a Labourer $\frac{3}{4}$ of a Day, to *slack*, *skreen*, *turn up* and *chaff*, at times	0	1	6
	0	18	$6\frac{1}{4}$

Which I allow at 19 *s.* and for which the Master, at $12\frac{1}{2}$ *per Cent.* Profit, must be paid 1 *l.* 1 *s.* $4\frac{1}{2}$ *d.*

And therefore,

If to - - - - - - - -	1	1	$4\frac{1}{2}$
Be added for Workmanship, with 25 *per Cent.* Profit	1	10	0
The Total is	2	11	$4\frac{1}{2}$

Which, with regard to Scaffolding, I allow at 2 *l.* 12 *s.* 6 *d.* for the *Master's Price per Rod*, for *Mortar* and *Workmanship*; wherein he has 11 *s.* 6 *d.* *per* Rod Profit.

And the total Expence *per* Rod to the Gentleman is but 5 *l.* 15 *s.* 6 *d.* For 3 *l.* 3 *s.* the prime Cost of the Bricks, being added to 2 *l.* 12 *s.* 6 *d.* the Price *per* Rod for *Mortar* and *Workmanship*, the Sum is 5 *l.* 15 *s.* 6 *d.*

BUT

BUT *when Gentlemen find their own Bricks and Mortar*, then the Bricklayer's Demand for Workmanship is but 1 *l.* 10 *s.* and Gentlemen pay but 5 *l.* 11 *s.* $6\frac{1}{4}$ *d. per* Rod for the whole: For,

If to the Workmanship *per* Rod at	1	10	0
Be added, For 4500 Bricks	3	3	0
For $41\frac{1}{4}$ Bags of Lime	0	15	0
For $16\frac{1}{2}$ Bushels of Sand	0	2	$0\frac{1}{4}$
For *slacking*, *skreening*, *&c.*	0	1	6
The Sum is but	5	11	$6\frac{1}{4}$

Which wants 8 *s.* $6\frac{1}{4}$ *d.* of 6 *l.* 0 *s.* $0\frac{1}{4}$ *d. per* Rod, as aforesaid; and which is upwards of 7 *l. per Cent.* saved.

SECT. III. *Of the Price of common Front Walling; as Fronts of Dwelling-Houses*, &c. *faced with Grey-Stock Bricks, with common (and with tuck-and-pat) Joints.*

OF *this Kind of Walling*, there are *three Varieties*, *viz.* *First*, That whose Courses are laid of the same Thickness of Mortar as *Place-Bricks* usually are, *viz.* For every 4 Courses in Height, to rise 1 Foot, and jointed in the common Manner.

Secondly, That whose Courses of Mortar are laid so much thinner than the preceding, as

as for every 4 Courses of Bricks to rise but 11 Inches in Height, and jointed as aforesaid.

And *Thirdly*, That whose Courses of Mortar don't exceed $\frac{1}{4}$ of an Inch in Height, and consequently every 4 Courses of Bricks to rise but 11 Inches in Height, as in the last, with tuck-and-pat Joints.

THESE are the *three Varieties of Grey-stock faced Walls*, whose Prices *per* Rod, at 1 Brick and half in Thickness, are as follows.

VARIETY I.

Of Walling, where every 4 Courses of Bricks rise 1 Foot in Height.

IN *this Kind of Walling*, every *Rod* will require the same Quantity of *Place-Bricks* and *Grey-Stock Bricks* taken together; the same Quantity of *Lime* and *Sand*, and the same Time of Workmanship; as before said of *Place-Bricks*, in the last *Section:* So that the whole Difference herein, wholly consists in the Price and Quantity of the *Grey-Stocks*; for a *grey Stock-Brick* is laid in the same Time, or, indeed, I think rather sooner, as being better to handle than a *Place-Brick*.

THE *Number of Grey-Stock Bricks*, in this Case, to face 1 Rod of Walling, is more or less, as the Manner of working the Courses is.

That

That is to ſay, *Firſt*, If every Front Courſe be laid with Headers and Stretchers, as in the Plan and Elevation, Fig. I. and II. Plate I. which is called the *Flemiſh Bond*, and which is very ſtrong and beautiful, then the Number of *Grey-Stocks* to the *Place-Bricks* will be as 4 is to 5. And therefore 2000 of *Grey-Stocks*, with 2500 of *Place-Bricks*, will do one Rod of Walling.

N. B. *Thoſe Bricks which, in the Plans*, Fig. II, IV, V, VII. *and* VIII. *are ſhadowed, ſignify Grey-Stocks, and thoſe unſhadowed, Place-Bricks.*

Secondly, If the Front Courſes be laid all *Headers* and all *Stretchers*, alternately, as Fig. III, IV, and V. then the Number of *Grey-Stocks*, and of *Place-Bricks*, will be equal, *viz.* 2250 of each.

This Kind of Bond is alſo very ſtrong and beautiful.

Thirdly, If the Front Courſes be laid all *Headers*, with whole and half Bricks, as Fig. VI. and VII. which is the moſt beautiful, and, I think, the ſtrongeſt, the Grey-Stocks and Place-Bricks will be alſo equal, as in the laſt. But if every Front Courſe be laid with Headers, as in Fig. VIII. where there are two heading half Bricks between every two heading whole Bricks; then the Grey-Stocks will be to the Place-Bricks, as 4 is to 5, as aforeſaid, in Fig. I, II. *which is equally as beautiful and as ſtrong* as the laſt: So that the Quantity wholly depends

depends upon the Kind of *Bond*, that may be chosen; *viz.* If after the Manner of Fig. II. and VIII. then 2000 *Grey-Stocks:* And if after the Manner of Fig. IV, V. and VII. then 2250 of each Kind.

N. B. *For the sake of saving about* 400 *Grey-Stocks in a Rod of Work, whose Value is not Half a Crown, Bricklayers will often carry up the Face of a Building of a Brick's Breadth only, for* 8, 10, *nay even* 12 *Courses together, (as in* Fig. IV.) *before they bond in upon the Place-Bricks: So that, in fact, the whole Wall, though of a Brick and half in Thickness, is very little stronger than a* 1 *Brick Wall; because, between the Grey-stocks and the Place-Bricks, there is an almost continued upright Joint.* Which is not only a very great Deceit, but, in *lofty Buildings*, is dangerous.

Now, the Expence, *prime Cost per* Rod, is as follows, *viz.*

First, According to the Manners of Fig. I, II. and VIII. Plate I. *viz.*

	l.	*s.*	*d.*
2500 of Place-Bricks, at 14 *s.*	1	15	0
2000 of Grey-Stocks, at 18 *s.*	1	16	0
$41\frac{1}{4}$ Bags of Lime, at 9 *s.*	0	15	0
$16\frac{1}{2}$ Bushels of Sand	0	2	$0\frac{1}{4}$
Slacking, Skreening, &c.	0	1	6
Workmanship	1	2	6
Total	5	12	$0\frac{1}{4}$

Which,

Which, with the aforesaid Allowances of Profits on the Materials and Labour, amounts unto 6 *l.* 7 *s.* 2 *d.* *per Rod.*

Secondly, According to the Manners of Fig. V. VI. and VIII. Plate I. *viz.*

	l.	*s.*	*d.*
2250 Place-Bricks, at 14 *s.*	1	11	6
2250 Grey-Stocks, at 18 *s.*	2	0	6
$41\frac{1}{2}$ Bags of Lime, at 9 *s.*	0	15	0
$16\frac{1}{2}$ Bushels of Sand	0	2	$0\frac{1}{4}$
Slacking, Skreening, *&c.*	0	1	6
Workmanship	1	2	6
Sum	5	13	$0\frac{1}{4}$

Which being but 1 *s.* more *per* Rod than the preceding Manners, I therefore judge it reasonable, that the Bricklayer be paid for this Kind of Walling *per* Rod, as follows, *viz.*

	l.	*s.*	*d.*
For Bricks, Lime, Sand, and Labour	6	10	6
For Lime, Sand, and Labour only	2	10	0
For Labour only	1	10	0

And therefore, when the Bricklayer finds Mortar, and Gentlemen the Bricks, the Expence *per* Rod is but 6 *l.* 2 *s.* and when the Bricks, Lime and Sand are found by Gentlemen, as aforesaid, the Expence *per* Rod is but 5 *l.* 19 *s.* 6 *d.* which being 10 *s.* 6 *d.* *per*

Rod leſs, than when the Bricklayer finds all Materials, is ſo much ſaved.

VARIETY II.

Of FRONT WALLING *faced with Grey-ſtock Bricks, where every four Courſes riſe but* 11 *Inches, with common Joints.*

SINCE that in this Kind of Walling every four Courſes of Bricks riſe but 11 Inches, as has been already obſerved, therefore 4870 Bricks are required to 1 Rod of this Kind of Walling, which, for the ſake of even Numbers in Computation, I allow at 4900, of which one half muſt be Place-Bricks, and the other Grey-Stock Bricks.

AND as by reducing the Thickneſs of the Courſes of Mortar, there is leſs Mortar, and more Bricks laid, than is in a Rod of Place-Brick Walling; therefore, when the Bricklayer finds all Materials, his extraordinary Time to lay the additional 375 Bricks, muſt be allowed by him, in Balance for his Advantage in uſing leſs Mortar; but when Gentlemen find their own Lime and Sand, then the Bricklayer has a Right to be paid for the laying of the additional Bricks, which, together, will employ (nearly or quite) a Bricklayer and Labourer 5 Days. And therefore,

The prime Coſt of one Rod of this Kind of Walling is as follows, viz.

	l.	*s.*	*d.*
2450 Grey-Stock Bricks, at 18 *s.*	2	4	1
2450 Place-Bricks, at 14 *s.*	1	14	3
$41\frac{1}{4}$ Bags of Lime	0	15	0
$16\frac{1}{2}$ Bushels of Sand	0	2	$0\frac{1}{4}$
A Labourer $\frac{1}{4}$ of a Day, to slack, skreen, turn up and chaff	0	1	6
A Bricklayer and a Labourer, each 5 Days, to lay Bricks	1	5	0
Total *prime Cost*	6	1	$10\frac{1}{4}$

Which, when all Materials are found by the Bricklayer, is worth 7 *l.* 0 *s.* $6\frac{1}{4}$ *d.* *viz.* 5 *l.* 7 *s.* $4\frac{1}{4}$ *d.* for his Materials, and 1 *l.* 13 *s.* $2\frac{1}{2}$ *d.* for his Labour.

BUT when Gentlemen find their own Bricks, then the *prime Cost* to the *Bricklayer* is as follows, *viz.*

	l.	*s.*	*d.*
$41\frac{1}{4}$ Bags of Lime	0	15	0
$16\frac{1}{2}$ Bushels of Sand	0	2	$0\frac{1}{4}$
A Labourer $\frac{1}{4}$ of a Day, to *slack, skreen, turn up* and *chaff*	0	1	6
A Bricklayer and Labourer, each 5 Days, to lay Bricks	1	5	0
Sum	2	3	$6\frac{1}{4}$

For which the Bricklayer must be paid (being allowed Profits as aforesaid) the Sum of 2 *l.* 12 *s.* 3 *d.* and then the Gentleman pays but

 6 *l.*

6 *l.* 10 *s.* 7 *d. per* Rod, which is 9 *s.* 11 *d.* leſs, than when the Bricklayer finds the Bricks. And when *Bricks*, *Lime* and *Sand* are found by Gentlemen, then the Expence *per Rod* is but 6 *l.* 8 *s.* 7 *d. viz.* 4 *l.* 15 *s.* $4\frac{1}{4}$ *d.* for Materials, at prime Coſt, and 1 *l.* 13 *s.* $2\frac{1}{2}$ *d.* for Workmanſhip; which is 11 *s.* $11\frac{1}{4}$ *d. per* Rod ſaved.

VARIETY III.

Of WALLING *faced with Grey-ſtock Bricks, where every* 4 *Courſes riſe but* 11 *Inches, with Tuck-and-pat Joints.*

IN *this Kind of Walling*, there is the ſame Number of *Bricks*, and the ſame Quantity of *Lime* and *Sand*, as in VARIETY II. the only Difference of Expence being in the Workmanſhip of the Joints, which is very conſiderable, as taking up a great deal of Time, and which is generally paid 6 *d. per* Foot ſuperficial, *extra*, more than the preceding Prices, *per* Rod.

So that the Expence *per* Rod, all Materials being found by the Bricklayer, is as follows, *viz.*

	l.	*s.*	*d.*
For Materials	5	7	$4\frac{1}{4}$
For Labour to the common Work	1	13	2
For 272 Feet ſuperficial of tuck-and-pat Joints, *extra*, at 6 *d. per* Foot	6	16	0
Sum *per* Rod	13	16	$6\frac{1}{4}$

Which,

Which, as I obſerved before, when Gentlemen find the Bricks, will be 9 *s.* 11 *d.* leſs, and when Bricks, Lime and Sand, 11 *s.* 11$\frac{1}{4}$ *d.* leſs; which, in large Works, is worthy of Notice.

N. B. *When Walls faced with Grey-ſtock Bricks are of greater Thickneſs than one Brick and a half, the* extra *Thickneſs muſt be conſidered and rated at the ſame Price* per *Rod as rough Walling,* p. 83. *becauſe there is no Jointing on either Side, and is performed in the ſame Time.*

NOTE ALSO, *That in all Front Walls, Bricklayers uſe two Sorts of Mortar,* viz. *The one finer than the other; the fine Sort to the Front Courſes, and the other to the Inſide Courſes;* but the Quantity of Lime in the whole is the ſame.

BEFORE I proceed farther, I think 'tis reaſonable to obſerve, that many Bricklayers charge their Labour of *tuck-and-pat Courſes,* at 9 *d. per* ſuperficial Foot, *extra,* which alone of itſelf, excluſive of Materials and common Work, amounts to 10 *l.* 4 *s.* and, together with Materials and common Work, 17 *l.* 4 *s.* 6 *d. per* Rod.

SURELY *nothing in other Trades* can come up to this *monſtrous Impoſition;* for even at the cheapeſt, *viz.* 6 *d. per* Foot for the Labour

of the *Tuck-and-pat Courses* only, the Amount thereof is but 4 *s.* 6¼ *d.* less than the whole Expence of all the Materials and common Work when taken together; so that, I think, no Person who knows this *(unless mad)* will go to such an Expence; and especially, when after all that the *best Bricklayer* can do, it has an *ill Effect*, and looks *as if the Mortar had no Union with the Bricks*, and was forced from them: Neither is it so strong, or so beautiful, as when worked in their Courses jointed in the common Manner, *as all the rubbed Red-stock Fronts*, &c. *are done*, of His *Grace* the *Duke* of MARLBOROUGH's House in St *James's Park*, built by that *great Architect* Sir CHRISTOPHER WREN; which would have *cost double the Money*, had the Courses been work'd *Tuck-and-pat*.

NAY, in *Brick-and-Half Garden Party-Walls*, faced on both Sides, as there are some about *Marlborough* House, had their Courses been worked *Tuck-and-pat*, they would have cost three times the Money they did; for the Courses so worked on both Sides, *exclusive of all Materials* and *common Work*, would have cost above 13 *l. per Rod* more than they did, and would not have been one Farthing the better.

I HAVE often experienced, that a tolerable good Bricklayer, without Hurry or Driving, but working of his own Free-will, will lay in very good Fronts 500 *Grey-Stock Bricks per Diem*,

Diem, with common Joints, which is about 1 Brick *per Minute*, with great Neatneſs: So that the prime Coſt *per Rod*, for Fronts of a Brick and Half Thickneſs, faced with Grey Stock Bricks, is as follows, *viz.*

	l.	*s.*	*d.*
2450 *Grey Stock Bricks* to the Front, at 18 *s. per* Thouſand	2	4	1
2450 *Place Bricks* to the Inſide at 14 *s.*	1	14	3
Mortar	0	18	6
1 Bricklayer and a Labourer five Days to the Front	1	5	0
1 Bricklayer and a Labourer two Days and Half within Side	0	12	6
Total *prime Coſt per Rod*	6	14	4

WHICH is 7 *l.* 2 *s.* 2*d. per Rod* leſs Money than with *Tuck-and-pat* Courſes, and is much ſtronger and handſomer.

	l.	*s.*	*d.*
NOW, as the *prime Coſt* of the Materials is 4 *l.* 16 *s.* 10 *d.* therefore at 12½ *per Cent.* Profit thereon, I muſt add to the above 6*l.* 14*s.* 4*d.*	0	12	1¼
And as the *prime Coſt* of the Labour is 1 *l.* 17 *s.* 6 *d.* therefore at 25 *per Cent.* Profit thereon, I muſt add	0	9	4½
And the total Expence *per Rod* is	7	15	9¼

Which is 6 *l.* 0 *s.* 8 *d* $\frac{1}{4}$. *per Rod* leſs Money, than when worked with *Tuck-and-pat Courſes*, at 13 *l.* 16 *s.* 6 *d. per Rod*; and is *ſtronger* and *more beautiful*, and not ſo ſubject to be injured by *Rains* and *Froſts*.

WHEN the *Maſter Bricklayer* finds all Materials, as in this Example, he has 1 *l.* 1 *s.* 3 $\frac{1}{2}$ *d.* Profit *per Rod:* But when Gentlemen provide their Bricks, Lime and Sand, and make up the Mortar fit for Uſe, then the Bricklayer's Profit *per Rod* in his Workmanſhip, is but 9 *s.* 4 $\frac{1}{2}$ *d.*

SECT. IV. *Of* COURT, &c. WALLS, Brick and Half in Thickneſs, *faced on both Sides with* GREY-STOCK BRICKS, *with common, and with Tuck-and-pat Courſes.*

WHEN *Court-Walls*, Brick and Half thick, &c. are faced on both Sides with *Grey-Stock Bricks*, the Expence *per Rod* is greater than the preceding, and is as follows, *viz.*

First,

First, *with common Jointed Courses.*

	l.	s.	d.
2900 Grey-Stock Bricks, at 18 *s. per* Thousand	4	8	2
Mortar, as being fine on both Sides	1	0	0
1 Bricklayer and a Labourer 10 Days	2	10	0
Total prime Cost	7	18	2
To this I add, for Profit on Materials at $12\frac{1}{2}$ *per Cent.*	0	13	6
And for Profit on Workmanship at 25 *per Cent.*	0	12	6
Total Expence *per Rod*	9	4	2

Of which the Master-Bricklayer has 1 *l.* 6 *s.* Profit, unless Gentlemen provide the Materials themselves; and then his Profit is but 12 *s.* 6 *d.*

Secondly, *With* TUCK-and-PAT *Courses.*

	l.	s.	d.
To the preceding Expence of Materials and common Work, *viz.*	9	4	2
Add for twice 272 Feet, *viz.* 544 Feet superficial, of *Tuck-and-Pat*, at 6 *d. per* Foot	13	12	0
And then the total Expence *per Rod* is	22	16	0

Which

Which is 13 *l.* 12 *s. per Rod*, more than the Work is worth when so performed.

HAVING thus explained the Quantities and Prices of Materials and Workmanship in the preceding Kinds of Brick-walling, I shall now by way of Digression, for the Entertainment and Instruction of my Readers, and young Students in Architecture, shew *the Manner of measuring all Kinds of Brick-walling*, and to *compute* and *estimate* the Quantities and Expence of *Bricks*, *Lime*, *Sand*, *&c.* necessary for any Quantity of Work, and in any Part of the Kingdom.

BRICK-WALLING is measured by these Rules, *viz.*

RULE I.

MULTIPLY the Length by the Height, at the same Thickness, and the Product will be the superficial Content.

RULE II.

MULTIPLY the superficial Content by the Number of Half Bricks contained in the Thickness of the Wall, and then the Product being divided by 3, the Number of Half Bricks in the Standard Thickness, the Quotient will be the Number of Feet reduced.

RULE III.

DIVIDE the Number of Feet reduced, by 272, the Number of superficial Feet in a Rod, and the Quotient will be the Number of Rods, and the Remains (when any) will be Feet.

As

As for Example.

Suppoſe a Piece of Brick-walling be 7790 *Feet in Length,* 12 *Feet in Height, and* 2 *Bricks and a Half in Thickneſs.*

Operation.

```
The Length      7790   Feet,
Multiplied by     12   the Height,
                ----
               15580
               7790
               -----
Product        93480   the ſuperficial Content.
Which multiply by  5   Half Bricks,
Product       467400.  Which divide by 3 as
                          follows, viz.
3)467400(155800  Quotient, which di-
  16··           vide by 272, as follows.
   17
   15
   --
    24
    24
    --
     0

272)155800(572 Rods
    1360··
    ----
     1980
     1904
     ----
      760
      544
      ---
      216  Feet.
```

For

For to readily find what Parts of a Rod the Remains are, when Divifion is over, I have here added the Aliquot Parts of a Rod as following.

A TABLE *of the Aliquot Parts of a fuperficial* ROD, *of* 272 *fquare Feet*, viz.

Feet.		
272	is	1 Rod
204		3 Quarters
136		a Half
68		a Quarter
34		an Eighth
17		a 16teenth
$8\frac{1}{2}$		a 32d
$4\frac{1}{4}$		a 64th
$2\frac{1}{8}$		a 128th

Now as 204 Feet is 3 Quarters, and the Remains is 216, therefore the above Quotient is 572 Rods, 3 Quarters and 12 Feet.

And for to readily divide any given Number of fuperficial Feet contained on the Face of any Wall, by 272, I have here added,

A TABLE *of* DIVISORS.

Viz.	272	is	1	Times.
	544		2	
	816		3	
	1088		4	
	1360		5	
	1632		6	
	1904		7	
	2176		8	
	2448		9	

The Uſe of this Table is as follows.

Suppoſe 160752 ſuperficial Feet on the Face of a Wall, be to be divided by 272, for to find the Number of Rods, as follows,

```
272) 160752 (591 Rods.
     1360..
     ------
      2475
      2448
      ----
        272
        272
        ---
          0
        ---
```

Here the firſt Queſtion is, how often is 272 in 1607, the firſt Punctation; which to know, I look in the Table of Diviſors for the

the next lefs Number, which is 1360, and againft it ftands 5 Times; which I put in the Quotient, and 1360, under 1607; and then fubftracting 1360 from 1607, the Remains is 247.

Again, to 247 bring down the next Figure of the Dividend 5, making 247, 2475, which next lefs Number in the Table of Divifors is 2448, againft which is 9 Times. Wherefore, putting 9 in the Quotient, and fubftracting 2448 from 2475, as before, the Remains is 27, to which the laft Figure 2 in the Dividend being annexed, makes 272, wherein, 272 is once, and the Quotient is 591 Rods.

N. B. When a Brick-Wall is of divers Thickneffes, as the Foundation of 3 Bricks, the next Part above it of 2 Bricks and a half; the next above that of 2 Bricks; the next above that $1\frac{1}{2}$ Brick, and the upper Part of 1 Brick; then the Dimenfions of each Part muft be taken feparately, and their Products being each reduced to ftandard Thicknefs, and added together (there being no Deductions of Doors, Windows, *&c.*) their Sum will be the Total Quantity required to be known.

As for EXAMPLE.

Suppofe a Wall of 220 *Feet in Length and* 20 *Feet in Height, of the following Thickneffes be given, viz.* Its Foundation for 3 Feet 6 Inches

Inches in Height, of 3 Bricks; the next two Feet ½ in Height, of 2 Bricks and a half; the next 5 Feet in Height, of 2 Bricks in Thickneſs; the next 5 Feet in Height, of 1 ½ Brick, and the upper Part 4 Feet in Height of 1 Brick; then the ſeveral Dimenſions and their reſpective Quantities of Feet reduced, will ſtand as following, *viz.*

		Feet reduced.
3 B)	220 0 3 6	540
2 B ½)	220 0 2 6	916 ⅔
2 B)	220 0 5 0	1466 ⅔
1 B ½)	220 0 5 0	1100
1 B)	220 0 4 0	586 ⅔
	Total	4610

N. B. When in Brick-Walling there be Windows, Doors, *&c.* care muſt be taken, to take their Dimenſions after thoſe of the Brick-Work are taken, and in the very ſame manner, ſignifying of what Thickneſs the Wall is, where every ſuch Deduction is made, and

and the Number of Times each Deduction is, where there are more than one of the ſame Magnitude.

Suppoſe in the preceding Wall there be 20 Windows, *viz.* 10 Windows, each 3 Feet by 3 Feet in 2 Brick thickneſs; and as many, 3 Feet by 3 Feet, in 1 Brick and a Half: Then I write down their Dimenſions, and Quantity of Feet reduced as follows, *viz.*

	D D.	Feet reduced.
2 B 10)	3 0 3 0	120 0
1 B ½ 10)	3 0 3 0	90 0
	Total	210

Now from 4610, the Number of reduced Feet in the whole, including the Deductions aforeſaid, ſubſtract 210 reduced Feet, contained in the Deductions; and the Remains, 4400 reduced Feet, is the Quantity of Brick-work, which being divided by 272, the Quotient is 16 Rods 48 Feet.

Brick-Work may be alſo meaſured by Cube Meaſure, and which very often can't eaſily be meaſured truely any otherwiſe, as angle Chimneys, &c. where the Dimenſions of the Plans

Plans, are not easily reduced to any certain Number of Bricks in Thickness.

Now as a Brick and a Half Wall is but $13\frac{1}{2}$ Inches in Thickness, *viz.* a Brick's Length $8\frac{1}{4}$ Inches, a Brick's Breadth $4\frac{1}{8}$ Inches, with a Joint of Mortar of $\frac{1}{8}$ of an Inch; therefore if 272 the Square Feet in a Rod Square, be multiplied by 1 Foot $1\frac{1}{2}$ Inch, the Thickness aforesaid, the Quotient 306 is the Number of Cube Feet in a Rod of Work; and therefore any given Quantity of Cube Feet of Brick-work being divided by 306, the Quotient will be the Number of Rods contained therein:

As for EXAMPLE.

In 8262 *Cube Feet of Brick Walling, how many Rods of Work?*

OPERATION.

```
306) 8262 (27 Rods.
     612
     ----
     2142
     2142
     ----
       00
```

N. B. Tho' 'tis Customary in the Measurement of Chimneys to measure the whole

 as

as solid Brick-work, (the Fire Places, from the Hearth, to the Height of the Mantle only excepted, which in every Chimney is always deducted;) yet I can by no means think it to be reasonable, when the Bricklayer finds Bricks and Mortar, because he is then paid for Materials which in Fact are not used. But indeed as to Workmanship only, with regard to his Trouble in carrying up the Withs and pargetting the Funnels; it is but reasonable, that all Funnels above each Mantle should be measured as solid Work, for in the same time, that he is carrying up the Withs, &c. he could work up the whole in a Solid.

Therefore, *to measure the Brick-work of Chimneys*,

First take the Dimensions of the whole as solid Work, and then deducting the Vacuities, as well those of the Funnels, as of the Fire Places, the Remains will be Brickwork, whose Materials being considered at prime Cost, and 12 ½ per Cent. added thereto, will be the Value to be paid the Bricklayer in case he provide them. But when they are provided by Gentlemen, then measure the whole as Solid, the Fire Places only excepted as before, and the Content of the Cube Quantity being reduced into Rods by Division as aforesaid, will be the Quantity of Work for which the Bricklayer is to be paid for his Workmanship, which is honestly worth 40 *s. per* Rod when separately perform'd.

N.

N. B. When 'tis required to reduce Cube Feet of Brickwork, to Rods at Standard Thickneſs, the following is the Rule, *viz.*

As 306 the Cube Feet in 1 Rod of Work, is to 1 Rod:

So is any given Number of Cube Feet of Brick-work, to the Number of Rods, *&c.* at Standard Thickneſs.

And for the ready dividing of any given Number of Cube Feet of Brick-work by 306, I have here annexed a Table of Diviſors, *viz.*

306		1	
612		2	
918		3	
1224		4	
1530	is	5	Times.
1836		6	
2142		7	
2448		8	
2754		9	

Now if 4500, the Number of Place Bricks in a Rod of Work, be divided by 306, the Number of Cube Feet in a Rod, the Quotient will be nearly $14\frac{1}{4}$, which is the Number of Bricks *per* Cube Foot.

And ſo in like manner,

If 4900, the Number of Grey Stocks in a Rod of Work, be divided by 306, as before,

the Quotient will be 16 $\frac{2}{153}$, which is the Number of Bricks *per* Cube Foot.

Now 'tis evident,

That any Number of Cube Feet of Place-Brick Work done, or to be done, being multiplied by 14 $\frac{3}{4}$; or of Grey Stock Brick Work by 16, the Product will be the Number of Bricks imployed, or required.

And therefore it follows,

That any known Number of Bricks being rated *per Thousand, &c.* at the prime Cost of the Country wherein they are made; the Sum will be the amount prime Cost of their Expence.

Now, if to the amount of the prime Cost of any Number of Place Bricks, or Grey Stock Bricks, be added 12 $\frac{1}{2}$ per Cent. which is an 8th Part, the Sum is their Value to be paid to the Bricklayer, exclusive of Workmanship as aforesaid.

As to the Value of Mortar which may be so used in Chimnies, it is no difficult Thing to discover, after you have found the Number of Cube Feet of Brick-work. For

As 306, *the Number of Cube Feet in a Rod, is to* 816 *Farthings, equal to* 17 *Shillings, the prime Cost of Mortar for* 1 *Rod of Work; so is* 10 *Cube Feet to* 26 $\frac{2}{3}$ *Farthings*; which, to

avoid Fractions, I allow at 28 Farthings, equal to 7 Pence, and which is the prime Coſt of Mortar in every 10 Cube Feet of Brick-work; and therefore, if to the amount of the prime Coſt of Mortar, be added 12 $\frac{1}{2}$ per Cent. Profit, the Sum is the Value of the Mortar to be paid to the Bricklayer.

I ſhall now add two Tables, ſhewing the Number of *Place Bricks*, and of *Grey Stocks*, (laid in thin Courſes as aforeſaid) that are contained againſt every ſuperficial Foot on the Surface of any Wall, from $\frac{1}{2}$ a Brick to 6 Bricks in Thickneſs, *viz.*

TABLE I.

Of the Number of Place Bricks in a ſuperficial Foot of Walling, &c. from $\frac{1}{2}$ a Brick to 6 Bricks in Thickneſs.

	Brick.		*Bricks.*
In one ſuperficial Foot of Walling, whoſe Thickneſs is	$\frac{1}{2}$	There is	$5\frac{1}{3}$
	1 0		$10\frac{2}{3}$
	1 $\frac{1}{2}$		16
	2 0		$21\frac{1}{3}$
	2 $\frac{1}{2}$		$26\frac{2}{3}$
	3 0		32
	3 $\frac{1}{2}$		$37\frac{1}{3}$
	4 0		$42\frac{2}{3}$
	4 $\frac{1}{2}$		48
	5 0		$53\frac{1}{3}$
	5 $\frac{1}{2}$		$58\frac{2}{3}$
	6 0		64

TABLE II.

Of the Number of Grey Stock Bricks in a superficial Foot of Walling, from ½ Brick to 6 Feet in Thickness.

In one superficial Foot of Walling, whose Thickness is	Brick		There is	Bricks.
		½		6
	1	0		12
	1	½		18
	2	0		24
	2	½		30
	3	0		36
	3	½		42
	4	0		48
	4	½		54
	5	0		60
	5	½		66
	6	0		72

Now if the ſuperficial Content of a Piece of Brick Walling, of any Thickneſs, be multiplied by the Number of Bricks, that is contained in its Thickneſs, againſt one ſuperficial Foot of its Surface, the Product is the Quantity of Bricks contained in the whole Wall.

As for EXAMPLE:

Suppoſe a Piece of Brick Walling 250 *Feet in Length,* 9 *Feet in Height, and* 3 ½ *Bricks in Thickneſs, whoſe ſuperficial Content is* 2250 *Feet,*

Feet, be given, to find the Number of Place Bricks contained therein.

In the first Column of the Table of *Place Bricks*, against 3 Bricks and ½ stands 37 ⅓ Bricks — and therefore 2250 being multiplied by 37 ⅓, the Product 84000, is the Number of Bricks contained therein.

And so in like manner, if the above superficial Feet of Walling had been of Grey Stocks, then 2250 must have been multiplied by 42 (as stands against 3 Bricks and a ½ in the Table of Grey Stock Bricks) and the Product 94500, would be the Quantity of Bricks.

EXAMPLE II.

To find how many Place Bricks will build a Park Wall one Mile in Length, 12 Feet in Height from the Bottom of the Foundation, and of the following Thicknesses, *viz.*

				Bricks.	
The	First	5	Feet in	2 ½	in Thickness.
	Next	2	Height	2	
	Upper	5	to be	1 ½	

This is the RULE, *viz.*

First multiply 5280, the Number of Feet in one Mile by 5 Feet the first given Height, and the Product 26400 by 26 ⅔ (the Number

ber of Bricks in 1 Square Foot on the Surface, at 2 Bricks and a ½ in Thickneſs) the laſt Product 704000, is the Number of Bricks required for the Bottom or Foundation Part.

2dly, Multiply 5280 into 2 Feet, the next given Height; and the Product 10560 into 21 ⅓ the Number of Bricks in 1 Square Foot on the Surface at 2 Bricks in Thickneſs; the laſt Product 225280 is the Number of Bricks required for the Middle Part,

3dly, Multiply 5280 into 5 Feet, the Height of the Upper Part, and the Product 26400 into 16, the Number of Bricks in 1 ſquare Foot on the Surface at 1 Brick and a ½; the laſt Product, 422400, is the Number of Bricks required for the Upper Part.

Now theſe three Products laſt found, being added together, their Sum 1351680, is the Total Number of Bricks required, and which being multiplied by the Market Price prime Coſt *per* Thouſand, in the Country where they are made and ſold, the Product will be their Total Expence.

NOW *to find the Number of Rods of Brick-work, which any given Quantity of Place Bricks, or Grey Stock Bricks will perform, this is the Rule,*

RULE

RULE.

Divide the given Number of Bricks (if Place Bricks) by 4500, and if Grey Stock Bricks by 4900, and the Quotient will be the Number of Rods.

So the aforesaid Number 1351680, being divided by 4500, the Quotient is 300 Rods $\frac{1}{4}$, and 475 Bricks remaining, of Place Brick-work; and being divided by 4900, the Quotient is 275 Rods and a Half, and 650 Bricks remaining, if of Grey Stock Work.

For to readily reduce any given Quantity of *Place Bricks* or *Grey Stock Bricks* into Rods. I have added the following Tables of Divisors.

TABLE I. *Of Divisors for* PLACE BRICKS.	TABLE II. *Of Divisors for Grey Stock Bricks.*
4500—1	4900—1
9000—2	9800—2
13500—3	14700—3
18000—4	19600—4
22500—5	24500—5
27000—6	29400—6
31500—7	34300—7
	39200—8
	44100—9

To find readily, the Aliquot Parts of a Rod, contained in the Remains, after Division is ended

ended (as in the preceding Computation) I have here added the following Tables, *viz.*

Table I. *Of the Aliquot Parts of a Rod of Place Bricks, viz.*

	Bricks.
1 Rod	4500
$\frac{3}{4}$ ——	3375
$\frac{1}{2}$ ——	2250
$\frac{1}{4}$ ——	1125
$\frac{1}{8}$ ——	$562\frac{1}{2}$
$\frac{1}{16}$ ——	$281\frac{1}{4}$
$\frac{1}{32}$ ——	$140\frac{5}{8}$

Table II. *Of the Aliquot Parts of a Rod of Grey Stock Bricks.*

	Bricks.
1 Rod	4900
$\frac{3}{4}$ ——	3675
$\frac{1}{2}$ ——	2450
$\frac{1}{4}$ ——	1225
$\frac{1}{8}$ ——	$612\frac{1}{2}$
$\frac{1}{16}$ ——	$306\frac{1}{4}$
$\frac{1}{32}$ ——	$153\frac{1}{8}$

EXAMPLE III.

To find what Length of Walling, at any given Height and Thickness, any given Number of Bricks will build.

Suppose a Wall is to be built 8 Feet in Height and 1 Brick and $\frac{1}{2}$ in Thickness, with 970000 Bricks; Of what Length will that Wall be?

Answer, 7578 Feet.

For 16 the Number of Bricks in 1 square Foot on the Surface, at 1 Brick and $\frac{1}{2}$ in Thickness, being multiplied by 8 Feet, the given Height of the Wall, the Product is 128, which are the Number of Bricks imployed in every Foot run in the Wall's Length; and therefore if

if 970000 the given Number of Bricks be divided by 128; the Quotient 7578 is the Number of Feet in Length required.

The next Thing in order of the Work is to ſhew,

How to find the neceſſary Quantity of Lime and Sand, that may be required for any given Quantity of Walling, by theſe Rules, *viz.*

RULE I. *To find the Quantity of Lime, neceſſary for any given Quantity of Walling, either in Foundations, &c. or Walls above Ground.*

Firſt, For FOUNDATIONS, *&c.*

MULTIPLY the Number of Rods given by 28 (becauſe 28 ſtriked Buſhels, or Bags, are nearly equal to 22 $\frac{1}{2}$ heaped Buſhels of Lime, the Quantity ſufficient for a Rod of Work) and the Product being divided by 25 (the Number of Buſhels in a Hundred of Lime) the Quotient will be the Number of Hundreds required.

As for EXAMPLE.

Suppoſe the Foundation and Party Walls up to the Ground Floor of a Building contain 27 Rods of Work. Then I ſay, if 27 Rods be multiplied by 28 ſtriked Buſhels, the Product 756 is the Number of Buſhels, and

which being divided by 25, as aforesaid, the Quotient is 30, and 6 remains; which is 30 Hundred and 6 Bushels.

Secondly, For WALLING *above Ground.*

MULTIPLY the Number of Rods given, by 41 $\frac{1}{4}$, the Number of Bags sufficient for a Rod of Work, and divide the Product as aforesaid, the Quotient will be the Hundreds required.

N. B. *In Countries where Lime is sold by the Load*, viz. 30 *or* 32 *Bushels, then instead of dividing the Number of Bags by* 25, *as before, you must divide by* 30, *or* 32, *according as the Number of Bushels or Bags which make a Load of Lime, as the Custom of the Place is, and then the Quotient will be Loads.*

AND *therefore it follows*, that if the Number of Hundreds, or Loads of Lime so found, be multiplied by the Market Price per Hundred or per Load prime Cost, the Product will be the Total prime Cost.

RULE II.

To find the necessary Quantity of Sand, for any given Number of Rods of Brick-work.

Multiply the Number of Rods given by 25, if for coarse Mortar in Foundations; and by

16

16 $\frac{1}{2}$, if for Walling above Ground; becauſe 25 heaped Buſhels of Sand, with as many heaped Buſhels of Lime, will make a Quantity of Mortar ſufficient for a Rod of rough Walling, as in Page 84; and becauſe 16 $\frac{1}{2}$ Buſhels of *Thames* Sand, with 41 $\frac{1}{4}$ Bags of Lime, will make a Quantity of Mortar ſufficient for a Rod of Walling above Ground, as in Page 88. And then the Product being divided by 24, the Number of heaped Buſhels in a Load of Sand, the Quotient will be the Anſwer required.

As for EXAMPLE.

WHAT *Quantity of Sand is required for coarſe Mortar to* 752 *Rods of Brickwork in Foundations?*

Anſwer, 783 Loads, 5 Buſhels.

FOR 752 multiplied by 25, the Product is 18800 Buſhels, which divided by 24, the Quotient is 783 $\frac{8}{24}$.

EXAMPLE II.

What Quantity of Sand is required for beſt Mortar to 752 *Rods of Brickwork above Ground?*

Anſwer, 517 Loads.

FOR 752 multiplied by 16 $\frac{1}{2}$, the Product is 12408 Buſhels; which divided by 24, the Quotient is 517.

NOW as from the preceding Rules and Examples, it is very eaſy to compute the Expence of any known Quantity of Walling, either of Materials

terials and Workmanſhip together, or ſeparately; I ſhall in the next Place, deſire every Gentleman, or his Steward, concerned in Building, to *Note*,

1. THAT Bricks are well burnt, *viz.* Free from thoſe which are called *Samel*, or imperfectly burnt.

2. THAT there be no Fraud in the Tale, or Number of Bricks, when received from the Kiln or Brick-Merchant, which is too often practiſed when not inſpected into.

3. THAT the Lime be freſh in the Stone and well burn'd, ſo that there be little or no Waſte by imperfect burnt Chalk-Stones, as has been already obſerved (in SECT. II. CHAP I.) and that you have honeſt Meaſure.

4. THAT due Care be taken, that the Inſide Joints of every Courſe of Bricks, are filled fluſh with Mortar, before the next Courſe of Bricks is laid; which Bricklayers, when they find Mortar, are very apt not to do, becauſe thereby they ſave a little Mortar and ſome Time. And indeed when Gentlemen find their own Mortar, they will, to ſave a little Time, do the ſame; whereby Buildings, much expoſed to Winds and hard driving Rains, are very frequently penetrated by them, which, where it ſo happens, is deſtructive to all K nds of Inſide Finiſhings of *Stucco*, *Wainſcot*, *Pa-*

per

per Hangings, &c. Beſides, there is no more Strength in the inſide Bondage, than when Bricks are laid dry without Mortar.

5. THAT every Courſe be ſo laid, that no two upright Joints be immediately over each other.

6. THAT all Advantage poſſible be made of the Rubbiſh of old Walling; for when 'tis trod and broke down fit for ſifting, by Carriages paſſing over it, being laid in the Street, as is frequently done in *London*, and ſkreen'd, it does not only come a great deal cheaper than Sand, whereby much Money is ſaved; but 'tis much better, as that it requires leſs Lime, and may be ſafely uſed even in froſty Weather, as I have often experienced, which Mortar made with Sand cannot be: For, as Sand cannot imbibe the Water with which Mortar is made, with that Force as Rubbiſh is found to do; Mortar ſo made is therefore a much longer time in conſolidating; and when it happens that 'tis frozen before its Union is confirmed, that its Cementing Quality, or cloſe Adheſion of Parts is deſtroyed by the expanſive Force of its frigid humid Particles, then at the Thaw, or Diſſolution of the Froſt, it moulders, and, by driving Rains, is waſhed out of the Courſes to very conſiderable Depths, whereby Walling is not only defaced, but is conſiderably weaken'd: And therefore when Rubbiſh

Rubbiſh is not to be had in froſty Weather, no outſide Walling or Tiling ſhould be done.

N. B. THE Mortars hitherto ſpoke of being ſuppoſed to be of Chalk Lime, it is therefore to be noted, that in Countries where ſtrong Stone Lime is uſed, the Quantity of Sand may be increaſed at the Diſcretion of the Workman according to the Strength of the Lime.

SECT. V. *Of* RED-STOCK FRONTS, *rubbed and edged only, with common jointed Courſes, and with* Tuck-and-pat *Courſes.*

THIS *Kind of Brick-walling*, when well performed, is very ſtrong and beautiful, *but is ſomething more expenſive than Walling faced with Grey-Stocks*; becauſe theſe Bricks are 12 *s. per* Thouſand more in Price at *prime Coſt*, and there is Time expended in rubbing, to face them, and for to juſt ſharpen their Arraces, which is not done in common Walling of *Grey Stock-Bricks*. But as to the Number of Bricks, Quantity of Lime and Sand, they are all the ſame as *Grey-Stock Work*, and Fronts are backed up within-ſide with Place-Brick, in the ſame manner, ſo that the Expence per Rod is as follows, *viz.*

Firſt,

First, With common jointed Courses, as at *Marlborough* House aforesaid.

	l.	*s.*	*d.*
2450 Red-Stock Bricks at 30*s.*	3	13	6
2450 Place-Bricks at 14*s.*	1	14	3
Mortar	0	17	0
272 Feet of Red-Stocks rubbed and edged, at 3*d. per* Foot	3	8	0
1 Bricklayer and a Labourer 5 Days to the Front	1	5	0
1 Bricklayer and a Labourer 2 Days and half to the within-side	0	12	6
Total prime Cost *per Rod*,	11	10	3
Now, as the Materials come to 6*l.* 4*s.* 9. I must therefore add, for 12½ *per Cent.* Profit thereon,	0	15	7
And as the Workmanship comes to 5*l.* 5*s.* 6*d.* I must therefore add for 25 *per Cent.* Profit thereon	1	6	4½
And then the total Expence *per Rod* is	13	12	2½

Out of which the Master-Bricklayer has 2*l.* 1*s.* 11½ Profit; but when Gentlemen find their own Bricks and Mortar, his Profit is but 1*l.* 6*s.* 4½*d.*

Secondly, With TUCK-and-PAT Courses.

To the preceding Expence *per Rod* of Materials and Labour, 13 *l.* 12 *s.* 2½, add

272 Feet of Tuck-and-Pat Courses at 6 *d. per* Foot,	6	16	0
And then the Total Expence *per Rod* is	20	8	2½

Which is 6 *l.* 16 *s. more* than 'tis worth.

SECT. VI. *Of* PARTY-WALLS *Brick and Half thick, between* COURT-YARDS, *&c. faced on both Sides with rubbed Red-Stock Bricks; with common Joints, and with Tuck-and-Pat Courses.*

FIRST, With common Joint Courses, *viz.*

	l.	*s.*	*d.*
4900 Red-Stock Bricks at 30 *s.*	7	7	0
544 Feet of Bricks rubbed and edged, at 3 *d.*	6	16	0
Mortar	0	17	0
1 Bricklayer and a Labourer 10 Days to lay Bricks	2	10	0
Total Expence *prime Cost*	17	10	0

Now,

Now, as the prime Coſt of the Materials is 8 *l.* 4 *s.* therefore allowing 12½ *per Cent.* Profit thereon,

	l.	*s.*	*d.*
I muſt add	1	00	6
And as the prime Coſt of the Workmanſhip is 9 *l.* 6 *s.* I muſt therefore, allowing 25 *per Cent.* Profit thereon, add more	2	6	6
And then the total Expence *per Rod* is	20	17	0

Out of which the Maſter-Bricklayer has 3 *l.* 7 *s.* Profit. But when Gentlemen find their own Materials of Bricks and Mortar, prepared ready for Uſe, then his Profit is but 2 *l.* 6 *s.* 6 *d.*

Secondly, With TUCK-and-Pat Courſes.

	l.	*s.*	*d.*
To the preceding Expence *per Rod*, of Materials and Workmanſhip	20	17	0
Add 544 Feet of Tuck-and-Pat Courſes, at 6 *d. per* Foot	13	12	0
And then the total Expence *per Rod* will be	34	9	0

Which is 13 *l.* 12 *s.* more than 'tis worth. But when Gentlemen find their own Materials, the Expence is but 19 *l.* 16 *s. per Rod*, viz.

For Materials,	8 *l.*	4 *s.*	0 *d.*
For Workmanſhip,	11	12	6

Which is 1 *l.* 0 *s.* 6 *d. per Rod*, ſaved.

SECT. VII. *Of* PLAIN WALLING, *with rubbed and gauged Red-Stock Bricks, set in Putty; exclusive of Arches to Windows, and all other Kinds of Ornaments.*

THIS Kind of Walling, when well perform'd, is of all others the moſt beautiful, and eſpecially when every Courſe is laid with Headers, as expreſſed in *Fig.* VI. *Plate* I.

To perform this Kind of Walling in the moſt ſubſtantial Manner, the Workman muſt gauge and rub down the Red-Stock Bricks; ſo, that every 5 Courſe of them ſhall come level with every 4 Courſe of Place-Bricks, worked up with them, within-ſide, as expreſſed in *Fig.* I. *Plate* III. Becauſe then, every 5th Courſe of the Red-Stocks, as *c c*, will bond on the Place-Bricks, and make ſubſtantial Work; notwithſtanding, that between every ſuch Bond, there are 4 Courſes of Red-Stocks, which are but a Brick's Breadth in Thickneſs, as *x x*, *&c.* and have an upright Joint between them and the Place-Bricks *z z*, *&c.* for their whole Height.

Note, In this Manner of Working, at every 4th Courſe of Place-Bricks in Height, the Height of the 1ſt Place-Brick, as *a*, being greater than that of the Red Stock-Brick *c*, the Courſe of Mortar at *b*, will be of an extraordinary

dinary Thickneſs; which muſt therefore be filled up with Tile-Sherds and Mortar, ſo as to bring every ſuch Courſe level with the Place-Bricks, that thereby the aforeſaid Bond may be maintained throughout the whole Height of the Building.

IN every Brick's Length, and Foot in Height, there will be 6 Red-Stock Bricks in Front, *viz.* 2 Headers, as *c*, and 4 Stretchers, as *x x*, *&c.* and 7 Place-Bricks to back them, (in a Brick and Half Wall;) ſo that the Number of Red-Stock Bricks, to the Number of Place-Bricks, are, as 6 is to 7.

IN a Wall ſo faced, every 2 Bricks Length, and a Foot in Height, will imploy 12 whole Bricks; and if it be allowed, that 2 Bricks Length, when laid, make 17 Inches, which they will do; then 17 Inches multiplied by 12 Inches (the Height of 5 Courſes) the Product is 204. And therefore it follows,

That as 204 Square Inches, is to 12 Bricks, ſo is 144 (the Number of ſquare Inches in a ſquare Foot) to $9\frac{1}{2}$, the Number of Bricks to 1 Foot; which, with regard to Waſte, and Eaſe in Computation, I allow at 10 Bricks *per* ſuperficial Foot.

NOW as 6 is to 7, ſo is 10, the Number of Red-Stocks *per* ſuperficial Foot, to $8\frac{24}{51}$, which is the Number of Place-Bricks *per* ſuperficial Foot. *And therefore it follows,*

THAT if 272, the Number of ſquare Feet in a Rod, be multiplied by 10, the Number of Red-Stocks *per* ſuperficial Foot, the Product 2720, is the Number of Red-Stocks required for to face 1 Rod of Walling.

And

IF 272 be multiplied by $8\frac{24}{51}$, the Number of Place-Bricks *per* ſuperficial Foot; the Product 2304 is the Number of Place-Bricks required, for to back up 1 Rod of rubbed and gauged Red-Stock faced Walling; and the total Number of both Kinds of Bricks *per* Rod is 5024, *viz.* 2720 of Red-Stocks, and 2304 of Place-Bricks.

The Mortar in which rubbed and gauged Bricks are ſet, is called PUTTY, *and is thus made:*

DISSOLVE in any ſmall Quantity of Water, as *two* or *three Gallons*, ſo much freſh Lime (conſtantly ſtirred with a Stick) until the Lime be entirely ſlacked, and the whole become of the Conſiſtency of Mud; ſo that when the Stick is taken out of it, it will but juſt drop; and then being ſifted, or run through a Hair Seive, to take out the groſs Parts of the Lime, is fit for Uſe.

THE *Expence* per *Rod of this Kind of* FACING WALLS, *of* $1\frac{1}{2}$ *Brick in Thickneſs, is as follows,* viz.

2720

	l.	*s.*	*d.*
2720 RED STOCKS at 30 *s.*	4	1	9
Profit thereon, at 12½ *per Cent.*	0	10	2½
2304 PLACE-Bricks at 14 *s.*	1	12	3
Profit thereon, at 12½ *per Cent.*	0	4	0½
MORTAR and PUTTY prepared	1	0	0
Profit thereon, at 12½ *per Cent.*	0	2	6
272 Feet of Facing, rubbed, gauged, and set, at 1 *s.*	13	12	0
Two third Parts of a *Rod* of Place Brickwork within-side, at 1 *l.* 1 *s. per Rod*	0	14	0
TOTAL Expence *per Rod*	21	16	9

WHICH is 1 *s.* 7 *d.* 1 *q. per* square Foot on the Surface, including the PLACE BRICK-WORK; and which, to avoid Fractions in Computation, I allow at 20 *d. per* Foot.

IF 18 *l.* 15 *s.* 2 *d.* the Amount of the Red-Stocks, with 12½ *per Cent.* Profit thereon, and of the Putty, allow'd at 11 *s.* 3 *d.* and of the Workmanship of rubbing, gauging and setting at 13 *l.* 12 *s.* be reduced into Farthings, (*viz.* 18000) and divided by 272, the Number of superficial Feet in a Rod; the Quotient 66 $\frac{1}{17}$, equal to 1 *s.* 4 *d.* 2 *q* $\frac{1}{17}$, is the Price *per superficial Foot*, for the Bricks, Putty, and Workmanship, exclusive of the Place Brickwork and Mortar within-side; which, to avoid Fractions, and in Consideration of the Trouble and Charge of Scaffolding, may be justly ascertained at 1 *s.* 6 *d. per superficial Foot.*

To find the Value, per *superficial Foot*, *of Workmanship, in any Part of the Kingdom*, this is the RULE.

As 3 *s. per* Day, the Workman's Wages at *London*, is to 1 *s.* the Master's Price *per* Foot in *London*;

So is the Price of the Country Workman's Wages *per* Day, to the Master's Price *per* Foot, when in the Country.

As for EXAMPLE.

SUPPOSE a Country Bricklayer be paid no more than 2 *s. per* Day,—Then I say,

As 36 *Pence*, a Bricklayer's Day Wages in *London*,
Is to 12 *Pence*, the common HONEST *Value* of Workmanship of 1 superficial Foot of rubbed and gauged Facing in *London*;
So is 24 *Pence*, the Bricklayer's Day Wages in the *Country*,
To 8 *Pence*, the *Price per Foot* in the *Country*.

N. B. *When Walls thus faced, are more than* 1 *Brick and a Half in Thickness, the extra Thickness must be consider'd and measured as rough Place-Brick Walling; and when Walls are faced on both Sides, then add to the above, for Materials and Labour* 1 s. 6 d. *and for Workmanship only*, 1 s. per *Foot*.

SECT.

SECT. VIII. *Of common* BRICK WALLING with TERRACE MORTAR, for Defence against *Waters*; as Walls to *Rivers*, *Canals*, *Ponds*, *Basons*, *Drains*, *Sewers*, *Conduits*, *Mill-Heads* of Water, *Bog-Houses*, &c.

THIS Kind of Walling ought to be made of the beſt burnt and ſoundeſt compact Bricks, that can be had; and therefore, where Place Bricks are not very good, Grey Stock Bricks ſhould be uſed; of which, thoſe of the worſt Colour, if well burnt, are as well for theſe Purpoſes, as thoſe of the beſt Colour.

When Walls of this Kind are to be built next to a River, as againſt a Bank, to preſerve it from being waſhed away; then to lay the Out-ſide Courſes four Inches in Terrace Mortar, and the Back Part in common Lime Mortar, will be ſufficient; and ſo the like for the Sides of Drains, Common Sewers, Mill-Heads, *&c.*

But where Water is required to be kept in, as in Ciſterns, Baſons, Canals, *&c.* whoſe Bottoms are ſecured; then every heading Brick, to make ſure and ſound Work, ought not only to be wholly laid in Terrace, but all the upright Inſide Joints at the Ends and Sides of

of Headers, and Sides of Stretchers, ſhould be carefully worked up in Terrace, that thereby ſuch Water as may Filter through their Pores, ſhall go no farther.

The Expence *per* Rod of this Kind of Walling, is greater than either of the preceding Kinds, and which conſiſts in the Mortar and Workmanſhip; the Quantity of Bricks being the ſame as in Grey Stock Brick Walling, where 4 Courſes of Bricks riſe but 11 Inches, *viz.* 4900 *per* Rod.

TERRACE MORTAR, as I have already ſaid, is made of Terrace and Lime without Sand, the Terrace being uſed in its ſtead; and the Expence *per* Rod prime Coſt, is according to the Quantity of Terrace uſed, *viz.*

I. *Of Brick and half Walling, laid entirely in Terrace.*

	l.	*s.*	*d.*
4900 of Grey Stock Bricks at 18 *s. per* Thouſand	4	7	8
41 ¼ Bags of unſlacked Lime	0	15	0
22½ ſtriked Buſhels of Terrace at 4 *s.*	4	10	0
1 Labourer 22½ Days to ſlack the Lime and beat it up in the Terrace, 1 Buſhel well beaten being a good Day's Work for a Labourer	2	5	0
	11	17	8

Brought

	l.	*s.*	*d.*
Brought over	11	17	8
1 Bricklayer to lay Bricks 5 Days	0	15	0
1 Labourer 5 Days to ditto	0	10	0
Prime Cost *per* Rod	13	2	8
Of which the Materials cost	9	12	8
And the Workmanship	3	10	0
Now, allowing the Master Bricklayer 12 ½ per Cent. Profit for his Materials, they come to	10	16	9
And allowing him 25 per Cent. Profit on his Workmanship, then that comes to	4	7	6
And the Total is	15	4	3

Which to avoid Fractions, I allow at 15 *l.* 5 *s.* *per* Rod, and which is nearly 1 *s.* 1 *d.* ½ *per* Foot.

But when Gentlemen find their own Materials, then the Expence is but 14 *l.* 0 *s.* 2 *d.* *per* Rod, *viz.*

For Materials at prime Cost	9	12	8
For Workmanship	4	7	6

Which is 1 *l.* 4 *s.* *per* Rod saved.

II. *Of Brick and half Walling, laid* 1 *Brick's Length in Terrace, and a Brick's Breadth in common best Lime Mortar.*

4900

	l.	*s.*	*d.*
4900 Grey Stock Bricks at 18*s.*	4	7	8
41 ¼ Bags of Lime	0	15	0
15 ftriked Bufhels of Terrace at 4*s.*	3	0	0
5 heaped Bufhels of Sand	0	1	7½
A Labourer 15 Days to beat up 15 ftriked Bufhels of Terrace with 30 Bufhels heaped of Lime	1	10	0
A Labourer ¼ Day to flack, fift, turn up, and chalf, 10 heaped Bufhels of Lime into common Mortar	0	0	6
1 Bricklayer 5 Days to lay Bricks	0	15	0
1 Labourer 5 Days to ditto	0	10	0
Prime Coft *per* Rod	10	18	9½
Of which the Materials coft	8	3	3½
And the Workmanfhip	2	15	6
Now, allowing the Mafter-Bricklayer 12½ per Cent. Profit on his Materials, they amount to	9	3	8½
And 25 per Cent. on his Labour, it amounts to	3	2	5½
And the Total Expence *per* Rod is	12	6	2

Which is nearly 11 *d.* *per* Foot.

But when Gentlemen find their own Materials, then the Expence is but 11 *l.* 5 *s.* 8 *d.* ½ *per* Rod, *viz.*

For

For Materials	8	3	3½
For Workmanship	3	2	5

Which is 1 *l.* 0 *s.* 5 *d. per* Rod saved.

III. *Of Brick and half Walling, laid a Brick's Breadth only in Terrace, and a Brick's Length in the best common Lime Mortar.*

	l.	*s.*	*d.*
4900 Grey Stock Bricks at 18*s.*	4	7	8
41¼ Bags of Lime	0	15	0
7½ striked Bushels of Terrace at 4*s.*	1	10	0
10 heaped Bushels of Sand	0	1	3
A Labourer 7½ Days, to beat 7½ Bushels of Terrace	0	15	0
A Labourer ½ Day to slack, sift, and turn up, and chaff the Mortar	0	1	0
1 Bricklayer 5 Days to lay Bricks	0	15	0
1 Labourer 5 Days to ditto	0	10	0
Prime Cost *per* Rod	8	14	11
Of which the Materials come to	6	13	11
And the Workmanship to	2	1	0
Now allowing the Master Bricklayer 12½ per Cent. Profit on his Materials, and 25 per Cent. Profit on his Labour; then the Value of his Materials is	7	10	9
And his Workmanship	2	11	3
And the total Expence *per* Rod is	10	2	0

Which

Which is nearly 9 *d. per* Foot.

But when Gentlemen find their own Materials, the Expence is but 9 *l.* 5 *s.* 2 *d. per* Rod, *viz.*

For Materials (as before)	6	13	11
For Workmanſhip	2	11	3

Which is 16 *s.* 10 *d. per* Rod ſaved.

Now from the Preceding 'tis evident, that the Expence of theſe Kinds of Walling *per* Rod, is as follows, *viz.*

1*ſt*, If laid *entirely* in Terrace	15	4	3
2*dly*, If laid 1 Brick *length* in Terrace, and the remains in Mortar	12	6	2
3*dly*, If laid 1 Brick's *breadth* only in Terrace, and the remains in Mortar	10	2	0

The ſeveral Prices of *Place Brick*, and *Grey Stock Brick Walling*, in all the common Varieties of Work being now explained; it therefore follows, that any Quantity or Number of Rods of any Kind of Walling being multiplied by the Price *per* Rod, the Product will be the Total Expence required; unleſs that, after Diviſion, there be odd Feet, leſs than an Half, Quarter, or Eighth remaining, whoſe Value may be found by this Rule, *viz.*

RULE.

Reduce the Price *per* Rod into Farthings, and then,

As 272, the Number of ſquare Feet in a Rod, is to the Number of Farthings in the Price of a Rod;

So is 1, *&c.* Foot to a 4th Number of Farthings; which is the Value of the odd Feet required.

EXAMPLE I.

What's the Value of 40 *Feet of Place Brick Walling, at* 5 *l.* 6 *s. per* Rod?

Now as in 5 *l.* 6 *s.* there are 106 Shillings, or 5088 Farthings; therefore as 272 Feet is to 5088 Farthings; ſo is 40 Feet to 748 Farthings, equal to 15 *s.* 7 *d.*

OPERATION.

```
272 : 5088  : 40 : 748
        40
      ------
272) 203520 (748
     1904..
     ------
      1312
      1088
     ------
       2240
       2176
     ------
         64
     ------
```

Which is 4 *d.* 2 *q.* $\frac{64}{272}$ per Foot.

EXAMPLE

EXAMPLE II. *Of* CUBE FEET *of Brick Work.*

What's the Value of 105 *Cubical Feet of Grey Stock Brick Walling, laid entirely in Terrace, at* 13 l. per *Rod?*

Now as 306 cubical Feet of Brick Work, are equal to a *Rod* of Work;

Therefore

As 306 Feet, the cubical Feet in a Rod, is to 12480, *the Number of Farthings in* 13 *l.* the Price of a Rod: So is 105, *the Number of Feet given,* to 4282 Farthings, equal to 4 *l.* 12 *s.* 10 *d. which is the Value of* 105 *Feet, as required.*

OPERATION.

Cube Ft.	Far.	Cube Ft.	Far.
306 :	12480 : :	105 :	4282

```
      12480
        105
    -------
      62400
     12480
    -------
306)1310400 (4282
    1224
    ----
      864
      612
     ----
      2520
      2448
      ----
        720
        612
       ----
        108 Remains.
```

SECT. IX. *Of Erect Circular, and Elliptical Walling.*

AN *Erect Circular Wall* is that whoſe Baſe is a Circle (as Fig. IV. Plate II.) or a Part of a Circle, (as the Segment Fig. I. and II. and the Semicircle) Fig. III.

AN *Elliptical Wall* is that whoſe Baſe is an Ellipſis, (as Fig. IV. or a Part of an Ellipſis, (as the Semi-Ellipſis. Fig. II. and III. Plate III.)

IN *all Works of theſe Kinds*, there is no more Materials imployed, than in ſtraight Walling: But the Time of Workmanſhip is conſiderably more. For as theſe Kinds of Walls can't be worked by a Line, as ſtraight Walling is; but muſt be worked up with a *Plumb Rule* and *Templets* of the ſame Curvature, as that of the Wall; they therefore imploy full half as much Time more than ſtraight Walling doth; and therefore muſt be allowed as *Work and Half*, *viz.* at half as much more Price as is paid for ſtraight Walling.

The Expence of all Kinds of Erect Circular, *&c.* Walling, is as follows, *viz.*

I. THE *Expence per Rod of Circular, &c. rough* PLACE BRICK WALLING *in Foundations, is as follows,* viz.

	l.	*s.*	*d.*
4500 Place Bricks at 14 *s.*	3	3	0
25 heaped Bushels, or 31 $\frac{1}{4}$ Bags of Lime unslacked, at 4*d.* $\frac{1}{2}$ *per* Bag	0	11	9$\frac{1}{4}$
25 Bushels of Sand at 1 *d.* $\frac{1}{2}$	0	3	1$\frac{1}{2}$
A Labourer $\frac{3}{4}$ Day to *slack, skreen, turn up* and *chaff*	0	1	6
Prime Cost of Materials *per* Rod is	3	19	5$\frac{1}{4}$
Which is nearly 3$\frac{1}{4}$ *per* Foot.			
To which I add Profit thereon at 12 $\frac{1}{2}$ *per Cent.*	0	9	11$\frac{1}{4}$
And then the Sum	4	9	5
Which I allow at	4	10	0

Is the Expence *per Rod* for Materials, which is 4 *d.* $\frac{2}{3}$ *per* Foot.

NOW *for the Workmanship.*

AS in SECT. I. of this Chapter, the Workmanship of a Rod of *rough Brick-work* in straight Walling, is allowed at 1 *l.* 0 *s.* 7 *d.* $\frac{1}{2}$ *which is nearly a Guinea*; we must in this circular Work allow the Workmanship at 1 *l.* 11 *s.* 6 *d. per Rod*; and for Materials and Workmanship at 6 *l. per Rod,* which is nearly 5 *d.* $\frac{1}{2}$ *per* Foot.

II. THE *Expence per Rod of circular* PLACE BRICK WALLING, *with common jointed Courses, is as follows,* viz.

4500

	l.	*s.*	*d.*
4500 Bricks at 14 *s.*	3	3	0
41 $\frac{1}{4}$ Bags of Lime at	0	15	0
16 $\frac{1}{2}$ heaped Bushels of Sand	0	2	0$\frac{1}{4}$
A Labourer $\frac{3}{4}$ Day to *slack*, *sift*, &c.	0	1	6
Prime Cost for Materials per Rod	4	1	6$\frac{1}{4}$
Which, to avoid Fractions, I allow at 4 *l.* 2*s.* which is very little more than 3 *d.* $\frac{1}{2}$ *per* Foot.	4	2	0
To which I add Profit thereon at 12 $\frac{1}{2}$ per Cent.	0	10	3
And then the Sum	4	12	3

Is the Expence *per Rod* for Materials, which is nearly 4$\frac{1}{4}$ *d. per* Foot.

NOW *for the Workmanship.*

AS in SECT. II. of this Chapter, the Workmanship of a *Rod* of this kind of straight Walling is allowed at 1 *l.* 10 *s.* 0 *d.* therefore herein it is worth 2 *l.* 5 *s.* and for Materials and Workmanship 6*l.* 17*s.* 3*d.* which is nearly 6 *d. per* Foot.

III. THE *Expence per Rod of circular* PLACE BRICK WALLING *faced on one Side only with* GREY STOCK BRICKS, *every four Courses to rise* 11 *Inches, with common Courses jointed*; and with *Tuck* and *Pat* Courses, is as follows, *viz.*

FIRST, with common jointed Courses.

	l.	s.	d.
2900 Grey Stock Bricks at 18*s*.	2	11	8
2000 of Place Bricks at 14*s*.	1	8	0
41 $\frac{1}{4}$ Bags of Lime at	0	15	0
16 $\frac{1}{2}$ Bushels of Sand	0	2	0$\frac{1}{4}$
Slacking, skreening, &c.	0	1	6
Prime Cost of Materials per Rod	4	18	2$\frac{1}{4}$
Which is very little more than 4 *d.* $\frac{1}{4}$ *per* Foot.			
To which I add Profit thereon at 12 $\frac{1}{2}$ per Cent.	0	12	3$\frac{3}{4}$
And then the Sum	5	10	6

Is the Expence *per Rod* for Materials, which is not quite 5 *d. per* Foot.

To which I add for Workmanship as in the last, *viz.*	2	5	0
And then the *Total Expence per Rod* for Materials and Labour is	7	15	6

Which is nearly 7 *d. per* Foot.

SECONDLY, When this Kind of Walling is faced with Grey Stocks, and the Courses are worked *Tuck and Pat* at 6 *d. per* Foot *extra*; then to the above Total of 7 *l.* 15 *s.* 6 *d.* must be added 6 *l.* 16 *s. for Tuck and Pat*, and the Total Expence *per Rod* will be 14 *l.* 11 *s.* 6 *d.* which is nearly 1 *s.* 1 *d. per* Foot; and which is 6 *l.* 16 *s. per Rod* more than 'tis worth; *because, when this Kind of Walling is neatly worked with common Joints,* 'tis

'tis not only stronger and more beautiful, but is performed for 6 l. 16 s. per Rod *less Money.*

IV. *The Expence per Rod, of circular Grey Stock Walling, with common jointed Courses, and with Tuck-and-pat Courses, is as follows,* viz.

FIRST with common jointed Courses,

	l.	*s.*	*d.*
4900 of Grey Stocks at 18*s.*	4	8	2 ½
41 ¼ Bags of Lime	0	15	0
16 ½ Bushels of Sand	0	2	0 ¾
Slacking, skreening, &c.	0	1	6
Prime Cost of Materials *per* Rod is	5	6	9 ¼
Which is nearly 4 *d.* 2 *q.* ½ *per* Foot.			
To which I add Profit thereon at 12 ½ per Cent.	0	14	2 ½
And then the Sum	6	0	11 ¾

Is the Expence *per Rod* for the Materials, which is nearly 5 *d.* ¼ *per* Foot.

Now *for the Workmanship,* viz.

	l.	*s.*	*d.*
One Bricklayer 15 Days	2	5	0
A Labourer 10 Days	1	0	0
Total prime Cost of Workmanship	3	5	0
Profit thereon at 25 per Cent.	0	16	3
Total Expence of Workmanship *per Rod*	4	1	3

Which is nearly 3 *d.* ¾ *per* Foot.

	l.	*s.*	*d.*
To which I add the total Expence of Materials	6	0	11$\frac{1}{2}$
And then the Sum	10	2	2$\frac{1}{2}$

Is the total *Expence per Rod of Materials and Labour*, which is nearly 9 *d.* $\frac{1}{2}$ *per* Foot.

N. B. In Cylindrical Walling 2 Labourers will serve 3 Bricklayers, with the same Ease as 3 Labourers will 3 Bricklayers in straight Walling.

SECONDLY, When this Kind of Walling is worked with Tuck-and-Pat Courses, then to the above Sum of 10 *l.* 2 *s.* 2 *d.* $\frac{1}{2}$ the further Sum of 13 *l.* 12 *s* must be added, for 544 square Feet, on the two Faces of the Wall at 6 *d. per* Foot; and the Sum Total *per* Rod for Materials and Labour will be 23 *l.* 14 *s.* 2 *d.* $\frac{1}{2}$, which is 13 *l.* 12 *s.* more than 'tis worth, as aforesaid.

V. THE *Expence per Rod of circular Walling, faced on one Side with* RED STOCK BRICKS, *rubbed and edged, every four Courses to rise* 11 *Inches with common jointed Courses, and with Tuck-and-Pat Courses, is as follows,* viz.

FIRST, with common jointed Courses.

	l.	s.	d.
2900 of Red Stock Bricks at 30*s*.	4	7	0
2000 of Place Bricks at 14*s*.	1	8	0
41 $\frac{1}{4}$ Bags of Lime	0	15	0
16 $\frac{1}{2}$ Bushels of Sand	0	2	0$\frac{1}{4}$
Slacking, *skreening*, &c.	0	1	6
Total Expence of Materials prime Cost	6	13	6$\frac{1}{4}$
Which is nearly 6 Pence *per* Foot.			
To which I add Profit thereon at 12$\frac{1}{2}$ *per Cent*.	0	16	8$\frac{1}{4}$
And then the Sum	7	10	3

is the Expence *per* Rod for the Materials; which is a little more than 6$\frac{1}{2}$ *d. per* Foot.

Now *for the Workmanship*.

	l.	s.	d.
A Bricklayer 9 Days to lay 2900 Stock-Bricks at 3 *s*.	1	7	0
A Bricklayer 6 Days to lay 2000 of Place-Bricks	0	18	0
1 Labourer 10 Days to serve *ditto*	1	0	0
272 Feet of Stocks, rubbed and edged, at 3 *d*.	3	8	0
Then the *prime Cost* of Workmanship *per* Rod is	6	13	0
And Profit thereon at 25 *per Cent*. being	1	13	3
Therefore the total Expence of Workmanship *per Rod* is	8	6	3

Which is nearly 7$\frac{1}{2}$ Pence *per* Foot.

 To

	l.	s.	d.
To which I add the total Expence of Materials	7	10	3
And then the Sum is	15	16	6
Which I allow at	16	0	0

For the total Expence *per Rod* of Materials and Workmanship, which is 1*s.* 2*d. per Foot.*

Secondly, WHEN *this Kind of Walling* is worked on the *out Face* with *Tuck-and-pat* Courses, then to the above Sum of 16 *l.* 0 *s.* must be added the farther Sum of 6 *l.* 16 *s.* for 272 square Feet of *Tuck-and-pat*, and the Sum total *per* Rod, for Materials and Labour, will be 22 *l.* 16 *s.* which is 6 *l.* 16 *s.* *per* Rod more than 'tis worth, as aforesaid.

VI. THE *Expence per Rod of circular Brick and ½ Walling, faced on both Sides with Red Stock Bricks, rubbed and edged, every four Courses to rise* 11 *Inches with common jointed Courses, and with Tuck and Pat Courses,* is as *follows*, viz.

FIRST, with common jointed Courses.

	l.	s.	d.
4900 of Red Stock Bricks at 30*s.*	7	7	0
41 ¼ Bags of Lime at	0	15	0
16 ½ Bushels of Sand	0	2	0¼
Slacking Lime, &c.	0	1	6
Total prime Cost of Materials *per* Rod is	8	5	6¼

Which

Which is nearly $7\frac{1}{2}$ *per* Foot.

	l.	*s.*	*d.*
To which I add Profit thereon at $12\frac{1}{2}$ per Cent.	1	0	$8\frac{1}{4}$
And then the Sum	9	6	3

Is the Total Expence *per* Rod for Materials, which is nearly 8 *d.* $\frac{1}{4}$ *per* Foot.

Now *for the Workmanship.*

	l.	*s.*	*d.*
A Bricklayer 15 Days to lay 4900 Bricks	2	5	0
A Labourer 10 Days to ditto	1	0	0
544 superficial Feet of Red Stocks, rubb'd and edg'd at 3 *d.*	6	16	0
Prime Cost of Workmanship *per* Rod is	10	1	0
Which is nearly 9 *d. per* Foot.			
To which add Profit thereon at 25 per Cent.	2	10	3
And then the total Expence of Workmanship *per* Rod is	12	11	3
To which I add the total Expence of the Materials	9	6	3
And then the Sum	21	17	6

Is the total Expence of Materials and Workmanship, which is nearly than 20 *d. per* Foot.

SECONDLY, When this Kind of Walling is worked on both Sides with *Tuck and Pat* Courses, then to the above Sum of 21 *l.* 17 *s.* 6 *d.* must be added the farther Sum of 13 *l.* 12 *s.* for 544 superficial Feet of *Tuck and Pat*, and the Total *per* Rod will be 35 *l.* 9 *s.* 6 *d.* which is 13 *l.* 12 *s.* *per* Rod more than 'tis worth, as aforesaid.

VII. THE *Expence per Rod of circular Brick and half Walling, faced on the Convex Side with rubbed and gauged Red Stock Bricks set in Putty, every five Courses in Front to rise one Foot, equal to four Courses of Place Bricks worked up against them within Side.*

	l.	*s.*	*d.*
2750 Red Stocks at 30*s.*	4	2	6
3150 Place Bricks at 14*s.*	2	4	1 $\frac{1}{2}$
41 $\frac{1}{4}$ Bags Lime at	0	15	0
16 $\frac{1}{2}$ Bushels of Sand	0	2	0 $\frac{1}{4}$
Labourer to make Putty 1 Day	0	2	0
To make coarse Mortar $\frac{1}{4}$ Day	0	1	6
Total prime Cost of Materials *per* Rod, is	7	7	1 $\frac{3}{4}$
To which I add Profit thereon 12 $\frac{1}{2}$ per Cent.	0	18	4 $\frac{1}{4}$
And the Sum	8	5	6

Is the total Expence *per* Rod of Materials, which is nearly 7 *d.* $\frac{1}{2}$ *per* Foot.

Now

I

Now *for the Workmanſhip*, viz.

	l.	s.	d.
272 Feet of *rubbed and gauged Work* ſet in *Putty*, at 1*s. per* Foot	13	12	0
3150 *Place Bricks* laid at 30*s. per* Rod, or *per* 4500 Bricks	1	1	0
Total Expence *per* Rod of Workmanſhip	14	13	0
To which I add, the above total Expence of Materials, *viz.*	8	5	6
And then the Sum	22	18	6

Is the total Expence *per* Rod of *Materials and Workmanſhip*, which is little more than 1 *s.* 8 *d. per* Foot.

To find the Value of the Workmanſhip of any Number of Bricks, leſs than the Number of Bricks required for one Rod of Walling, at 1 ½ Brick in Thickneſs, this is the

ANALOGY.

As the Number of Bricks required to one Rod of Walling
Is to the Maſter's Price *per Rod* for Workmanſhip;
So is any given Number of Bricks
To the Value of their Workmanſhip.

So

So here, in the preceding *Estimate*, the Workmanship of 3150 *Place Bricks*, at 30 *s.* *per* Rod, comes to 1 *l.* 1 *s.*

For, as 4500 *Place Bricks in a Rod*,
Is to 30 *s.* *their Value of Workmanship*;
So is 3150 *Place Bricks*,
To 21 *s.* *their Value of Workmanship*.

VIII. The *Expence per Rod of circular Brick and* $\frac{1}{2}$ *Walling, faced on both Sides with rubb'd and gaug'd Red Stock Bricks set in Putty, every five Courses of Red Stocks to rise one Foot, is as follows*, viz.

N. B. As in two Bricks length, and one Course in height, there is 6 Bricks, as represented in Fig. V. Plate III. therefore in 5 such Courses, there are 30 Bricks: And as 5 such Courses of two Bricks in length, which are nearly 1 $\frac{1}{2}$ Foot, at 1 Foot in Height, contain 30 Bricks, therefore in every superficial Foot on the Surface, there are 20 Bricks.

Now 272, the Number of superficial Feet in a Rod of Brick-work, being multiplied by 20, the Number of Bricks in a superficial Foot, the Product 5440, is *the Number of Bricks required for one Rod* of this Kind of Walling: But as 'tis impossible to work without some *Waste*, I shall therefore allow 5500 of *Bricks for the Performance of one Rod of Work*, and then the Expence *per Rod* is as follows, *viz.*

	l.	*s.*	*d.*
5500 Red Stock Bricks at 30*s.*	8	5	0
1 Hundred and ½ of Lime	0	13	6
A Labourer 2 Days to make Putty	0	4	0
Prime Coſt of Materials per Rod is	9	2	6
Which is a little above 8 *d. per* Foot.			
To which I add Profit thereon at 12 ½ per Cent.	1	2	10
And then the Sum	10	5	4

Is the total Expence *per* Rod of the Materials, which is little more than 9 *d. per* Foot.

To which I add for Workmanſhip.

viz.	*l.*	*s.*	*d.*
For rubbing and ſetting 544 ſuperficial Feet in the two Faces, 1 *s. per* Foot,	27	4	0
And then the Sum	37	9	4

Is the *total Expence per Rod*, for *Materials and Workmanſhip*; which is very near 2 *s.* 10 *d. per* Foot.

IX. THE *Expence per Rod, of Brick and ½ circular* PLACE BRICK WALLING, *faced on one Side with Grey Stocks; the outward Brick's breadth laid in Terrace, and the inward Brick's length in Lime Mortar; every* 4 *Courſes, to riſe but* 11 *Inches, is as follows,* viz.

2450

	l.	s.	d.
2450 Grey Stocks at 18 *s.*	2	4	$1\frac{1}{4}$
2450 Place Bricks at 14 *s.*	1	14	3
$7\frac{1}{2}$ Bushels striked of Terrace	1	10	0
10 Bushels of Sand	0	1	3
$41\frac{1}{4}$ Bags of Lime	0	15	0
Total prime Cost of Materials *per* Rod	6	4	$7\frac{1}{4}$
Which is nearly 6 *d. per* Foot.			
To which I add Profit at $12\frac{1}{2}$ per Cent.	0	15	$6\frac{1}{4}$
And then the Sum	7	0	2

Is the total Expence of Materials, which is nearly $6\frac{1}{2}$ *per* Foot.

Now *for the Workmanship,* viz.

	l.	s.	d.
To beat $7\frac{1}{2}$ Bushels of Terrace, 1 Labourer $7\frac{1}{2}$ Days	0	15	0
To slack, sift, or skreen, &c. the Lime, 1 Labourer $\frac{1}{2}$ a Day	0	1	0
1 Bricklayer 5 Days to lay 4500 Bricks	0	15	0
1 Labourer 5 Days to ditto	0	10	0
Total prime Cost of Labour *per* Rod	2	1	0
To which I add Profit, at 25 per Cent.	0	10	3
And then the Sum	2	11	3

19

Is the total Expence *per* Rod of Workmanſhip; which is ſomething more than 2 *d.* $\frac{1}{4}$ *per* Foot.

	l.	*s.*	*d.*
NOW, if to the total Expence of Materials	7	0	2
Be added, the total Expence of Labour	2	11	3
The Sum	9	11	5

Is the total Expence per Rod of Materials and Workmanſhip; which is 8 *d. per* Foot.

X. THE *Expence* per *Rod of Brick and Half* CIRCULAR WALLING, *whoſe outward Brick's Length is of* GREY-STOCKS *laid in Terrace Mortar, and inward Brick's Breadth is of* PLACE BRICKS, *laid in the beſt ſort of Lime Mortar, every* 4 *Courſes to riſe but* 11 *Inches, is as follows,* viz.

	l.	s.	*d.*
3250 Grey-Stocks at 18 *s.*	2	18	6
1650 Place Bricks at 14 *s.*	1	3	$3\frac{1}{2}$
15 Buſhels ſtriked of Terrace, at 4 *s.*	3	0	0
41 $\frac{1}{4}$ Bags of Lime at	0	15	0
5 Buſhels of Sand	0	0	$7\frac{1}{2}$
Prime Coſt of Materials *per* Rod which is nearly 7 *d. per* Foot.	7	17	5
To which I add Profit at $12\frac{1}{2}$ *per Cent.*	0	19	8
And then the Sum	8	17	1

Is

Is the total Expence *per* Rod of the Materials; which is nearly 8 *d. per* Foot.

Now *for the Workmanship.*

	l.	s.	d.
1 Labourer 15 Days to slack Lime, turn up & beat 15 Bush. of Terrace	1	10	0
1 Labourer $\frac{1}{4}$ Day to slack, skreen, turn up, and chaff Mortar	0	0	6
1 Bricklayer 5 Days to lay Bricks	0	15	0
1 Labourer $3\frac{1}{2}$ Days to *ditto*	0	7	0
Total prime Cost of Labour *per* Rod	2	12	6
To which I add Profit at 25 per Cent.	0	13	$1\frac{1}{2}$
And then the Sum	3	5	$7\frac{1}{2}$

Is the total Expence *per Rod* of Workmanship; which is nearly 3 *d. per* Foot.

Now if to the total Expence of Materials	8	17	1
Be added the total Expence of Workmanship, *viz.*	2	12	6
Then the Sum	11	9	7

Is the total Expence *per* Rod of Materials and Labour, which is nearly 10 *d.* $\frac{1}{4}$ *per* Foot.

XI. *The Expence per Rod of Brick and* $\frac{1}{2}$ *circular Walling, entirely of Grey Stock Bricks, laid entirely in Terrace Mortar, every* 4 *Courses to rise but* 11 *Inches in height,* is as *follows,* viz.

4900

	l.	s.	d.
4900 Grey Stocks at 18 *s.*	4	7	8
16 $\frac{1}{2}$ Bushels of Terrace at 4 *s.*	3	6	0
41 $\frac{1}{4}$ Bags of Lime	0	15	0
Prime Cost of Materials *per* Rod is	8	8	8
To which I add, Profit at 12 $\frac{1}{2}$ per Cent.	1	1	1
And then the Sum	9	9	9

Is the total Expence *per* Rod of the Materials, which is nearly 8 *d.* $\frac{1}{2}$ *per* Foot.

Now *for the Workmanship.*

	l.	s.	d.
1 Labourer 16$\frac{1}{2}$ Days to beat 16$\frac{1}{2}$ Bushels of Terrace	1	13	0
To slack and skreen Lime	0	0	6
1 Bricklayer 5 Days to lay Bricks	0	15	0
1 Labourer 3 $\frac{1}{2}$ Days to ditto	0	7	0
Total prime Cost of Labour *per* Rod	2	15	6
To which I add Profit at 25 per Cent.	0	13	10$\frac{1}{2}$
And then the Sum	3	9	4$\frac{1}{2}$

Is the total Expence *per* Rod of Workmanship, which is a little more than 3*d.* *per* Foot.

	l.	*s.*	*d.*
Now if the total Expence of the Materials	9	9	0
Be added, the total Expence of Workmanship	3	9	$4\frac{1}{2}$
Then the Sum	12	18	$4\frac{1}{2}$

Is the total Expence of Materials and Labour, which is very near $11\frac{1}{2}$ *d. per* Foot.

HAVING now shewn the Expences of all the Varieties of Works in circular Walling; I will now shew how to describe or set out for Work such Walls; and to measure them when built.

PROBLEM I. Fig. I. Plate II.

The Extreams of the Arch of a Circle, as a c b, *being given, to find its Centre geometrically.*

OPERATION.

Draw the Chord Line *a b*, and from the given Point *c*, draw the right Line *c d*, at right Angles to *a b*; draw the Chord Line *a c*, which divide in two equal Parts at *e*, whereon raise the Perpendicular *e d*, which will intersect the Line *c d*, in the Point *d*, *which is the Centre required*, on which the Arch *a c b* may be described.

THIS *Problem may be performed Arithmetically, as follows,* viz.

RULE

RULE.

Divide the Quadrature of *a x*, *viz.* of half the Chord Line *a b*, by *x c* the versed Sine, or Altitude of the Segment; then adding the Quotient to *x c* the versed Sine, the Sum is the Diameter of a Circle, of which the Segment is a Part.

EXAMPLE.

a x	Half the Chord Line is	10
	Multiplied by	10
	The Quadrature is	100

which being divided by *x c* 6, the versed Sine, the Quotient is $16\frac{2}{3}$, and which added to 6, the versed Sine, the Sum is $22\frac{2}{3}$, which is the Length of the whole Diameter; and therefore, setting $11\frac{1}{3}$ Feet from *c* to *d*, the Point *d* will be the Centre required.

PROB. II. Fig. II. Pl. II.

The Extreams of the Arch of a Circle (as a c b*) being given, to describe its Arch, without Regard being had to its Centre.*

☞ This is a very useful Problem; because in Practice, 'tis frequently required to describe the Arch of a Circle, when there is no possibility of coming at its Centre, without very great Inconveniency, *&c.*

OPERATION.

Fix together two ſtraight-edged Pan-Tile Laths, &c. as *e c f*, ſo that the angular Point made by them, at the Extream *c* and their Sides, may touch the given Extreams *a c b*; this being done, apply the angular Point *c* at the Point *a*, and the Side *c f* to touch the Point *b*; then moving the angular Point from *a* to *c*, and from thence to *b*, keeping always the two out Edges cloſe up to the Points *a* and *b*, it will trace the Curve or Arch Line *a c b*, as required.

So in like manner, Fig. III. any Semicircle, or entire Circle may be deſcribed, with the help of a Square, as *g h b*, applyed between the Extreams of its Diameter *a c*.

PROB. III. Fig. II. Pl. III.

To deſcribe a Semi-Oval of any given Length and Breadth, as a b c.

OPERATION.

1*ſt*, Make *a c* equal to the given Length; biſect *a c* in *g*, and make *g b* perpendicular to *a c*, and equal to the given Breadth.

2*dly*, Make *a e* equal to *b g*, and divide *e g* in three equal Parts, and make *e d* equal to one of thoſe Parts.

3*dly*, Make *g f* equal to *g d*, and on *d f* make the equilateral Triangle *d f k*, continuing

nuing the Side *k d* towards *l*, and the Side *K f* towards *m*.

4*thly* On the Points *d* and *f*, with the Radius *a d* describe the Arches or Hanches *a b* and *i c* ; and on the Point *k* with the Radius *k h*, describe the Arch or Scheme Part *b b i*, which will complete the Semi-Oval as required.

PROB. IV. Fig. III. Pl. III.

To describe a Semi-Ellipsis of any Length and Breadth, by the Help of a Tramel.

OPERATION.

Set out the Length *a c*, and Breadth *b z*, as in the last Problem ; and fix the Tramel on the long Diameter *a c*, so that its Center *z* may be directly in the middle, and its Arm *e z* lye on the Semi-Diameter *b z* : This being done, lay the Describent *b x* on the long Diameter *a c*, so that its End may extend something beyond the Point *c* ; and at the Point *c*, fix the describing or tracing Point *x*, and as the Points *n* and *m* are moveable, therefore make the Distance of *x n* equal to (*z c*) half the long Diameter ; and the Distance *x m* equal to *b z* the given Breadth. Then putting the two Points *n* and *m* into the Grooves of the Tramel, with the tracing Point *x* at one End, as at *a*, with one Hand move it from *a* to *p*, thence to *b*, thence to *x*, and thence to *c*, whilst the other Hand guides the Pins or Points *n* and *m* in their respective

Grooves, and then the Point *x* will have describ-ed the Semi-Ellipsis *a b c*, as required.

Prob. V. Fig IV. Plate III.

To describe a Semi-Ellipsis of any Length and Breadth, by the help of a Line, &c.

OPERATION.

Make *a c* equal to the given Length, and bisect *a c* in *d*; make *d b* equal to the given Breadth, and perpendicular to *a c*.

On the Point *b*, with the Distance *d c* (half the long Diameter) intersect the long Diameter *a c* in the two Focus Points *e* and *f*, wherein drive two Nails, &c. about either of which put a double Line of Twine, Pack-thread, &c. which shall reach unto the End of the long Diameter, as to *a*. Then with a Pencil or Tracer applied upright within the doubled Line, trace the Curvature of the Semi-Ellipsis as required.

Prob. VI. Fig. IV. Plate III.

To describe a Semi-Oval of any Length and Breadth, as a g c, *without regard being had to the Centres of the Arches, of which 'tis composed.*

OPERATION.

1*st*, Make *a c* equal to the given Length; bisect *a c* in *d*; make *d g* equal to the given Breadth, and perpendicular to *a c*; on *d* with the

the Radius *d g* describe the Arch of a Quadrant, as *g i k l b*, and divide *d b* into any Number of equal Parts; suppose four, as at the Points *m n o*, and draw the Ordinates *o l*, *n k*, *m i*, parallel to *d g*.

2*dly*, Divide *a d* in the same Number of equal Parts, as *d b*, *viz.* Four, at the Points *s t v*, from whence draw the Ordinates *s p* *t q*, and *v r*, &c. parallel to *d g*.

3*dly*, Make the Ordinate *v r* equal to the Ordinate *m i*; also the Ordinate *t q* equal to the Ordinate *n k*; also the Ordinate *s p* equal to the Ordinate *o l*, &c. and from the Point *a* to the Point *g*, through the Extreams of the Ordinates, *viz.* the Points *p q r*, trace the Curve *a p q r g*; or those Points being represented by Tacks or Nails, and a Lath being bent to them, the Curve or Quarter Part of the Oval may be very truly described thereby; and so in like manner the other Quarter Part *g c*, (or an entire Oval) may be described.

N. B. For to set out the Foundation of any *Elliptical*, *Ovalar*, or *Circular Building*, it is always best done, by first describing the Plan as large as the Building is to be on a large Floor, capable to receive it; and then from the Plan so made, to make a Mold or Templet with slit Deal equal to it, which being applyed on the Foundation where the

Building is to be erected, and Lines being traced by its Edges on the Ground, and the first Course of Bricks being laid to those Lines, the Work will then be set out with Truth, and being raised erect in every of its Parts, will be truly *Circular*, *Elliptical* or *Ovalar*, as may be required.

To carry up an entire circular Wall, as Fig. IV. Plate II. after the first Course of Bricks are laid as aforesaid; 'tis best to divide the Circumference into some certain Number of Parts (nearly or exactly equal) suppose 8, as at the Points *a b c d e f g h*, and at those Points, carry up the Wall by the Help of a Plumb Rule, of about 3 Bricks length in Breadth, and as many Courses in Height as may be convenient, as 5, 6, *&c.* at a Time.

This being done, cause two Templets to be made of slit Deal, as *h i*, for the Out-side, and *k n* for the In-side, of the same Curvatures as the exterior and interior Circles are which limit the Thickness of the Wall; which Templets being applied to the upright Parts at *a b c*, *&c.* will be sure Guides for to carry up all the intermediate Parts: And so in like manner, the same Method is to be observed in all Segments, as Fig. I. II. *&c.*

The same Method is also to be followed in carrying up an Elliptical or Ovalar Wall, as Fig. IV. Plate III. excepting that therein, there

there muſt be Templets made for the In-ſide and Out-ſide of one Quarter Part of the whole, as *s t* and *v w*, whoſe outer Ends muſt be carefully kept to perpendicular Lines, raiſed and carryed up from the Extreams of the two Diameters, as at *a b c, &c.*

N. B. TEMPLETS ſo made, to 1 quarter of an Ellipſis, by turning them will do for the whole.

NOW before I can ſhew the Rule by which theſe Kinds of Walling are truely meaſured *(and which has never yet been publiſhed by any Author)* I muſt

Firſt ſhew, a *Rule to meaſure or find the Area of a Circle and of an Ellipſis, and their Parts*; as being not only abſolutely neceſſary ſo to do, but with regard to its being a very uſeful, and a delightful Digreſſion, and indeed, *the Extraction of the ſquare Root muſt be alſo known*, before the Area of an Ellipſis can be found; which for the further Inſtruction and Entertainment of young Students, I will fully explain (as being of very great uſe in many Important Affairs.)

BUT before the Area of a Circle, or of any Part of it can be found, its Diameter, or Circumference muſt be given, in order that they may be both known.

WHEN

WHEN *the Diameter of a Circle is given, its Circumference is found* by

This ANALOGY, *viz.*

As 7 is to 22, ſo is the given Diameter to the Circumference required.

Suppoſe the given Diameter of a Circle be 15 Feet, What's the Circumference?

Anſwer $47\frac{1}{7}$.

OPERATION.

$7 : 22 :: 15 : 47\frac{1}{7}$

$$\begin{array}{r} 22 \\ \hline 30 \\ 30 \\ \hline 7)330\ (47\frac{1}{7} \end{array}$$

But as this Analogy makes the Circumference ſomething more than the real Truth; therefore where a greater Exactneſs is required, then ſay,

As 113 is to 355; or
As 1000, is to 3,140; ſo is the Diameter to the Circumference.

That is,

As $113 : 355 :: 15 : 47\frac{14}{113}$.
Which Fraction $\frac{14}{113}$ is a little more than $\frac{1}{10}$.

For

For as 113 its Denominator
Is to 14 its Numerator,
So is 10 a Decimal Denominator
To 1, and 27 Parts of 1, divided into 113,
its Numerator.

Again,

As 1000 : 3,140 : : 15 : 47 $\frac{1}{10}$

Which is very little leſs than before; and both ways very little leſs than the firſt; ſo that in common Works, any of the *three Analogies* may be uſed.

And ſo *the Circumference of a Circle being given, its Diameter is found in like manner, by the Converſe of the preceding*, viz.

As 22 is to 7: ſo is the Circumference, ſuppoſe 47 $\frac{1}{10}$, to the Diameter.

That is,

As 22 : 7 : : 47 $\frac{1}{10}$: 14 $\frac{17}{20}$, the Diameter.

OR,

As 355 : 113 : : 47 $\frac{1}{10}$, : 14 $\frac{225}{355}$ the Diameter.

OR,

As 3,140 : 1000 : : 47 $\frac{1}{10}$: 15 the Diameter.

THESE *Analogies* for finding the Diameter, or Circumference of a Circle being underſtood, the Area of any Circle may be eaſily found, as follows.

PROB.

PROB. VII.

To find the Area of any Circle, having the Diameter given: Suppoſe 12 Feet.

I. By EUCLID.

RULE.

SQUARE *the Diameter, and divide the Quadrature (which is the Product) by* 14. *From the Quadrature, ſubtract three Times the Quotient, and the Remains is the Area of the Circle required.*

EXAMPLE.

Let the given Diameter be 15 *Feet, what's the Area of the Circle?*

OPERATION.

```
      15
      15
      --
      75
     15
     ---
14)225,(16,1/14 Quotient
     14
     --
      85
      84
      --
       1
```

Now

Now from the Quadrature	225
Subtract 3 Times the Quotient, *viz.*	$48\frac{3}{14}$
Then the Remains is the Area of the Circle required.	$176\frac{11}{14}$

II. By PLATO.

RULE.

MULTIPLY *half the Circumference by half the Diameter; and the Product is the Area of the Circle required.*

Now, Half the Diameter is	$7\ \frac{12}{20}$
And Half the Circumference is	$23\ \frac{11}{20}$
Whose Product is	$176\ \frac{7}{20}$

Which is the Area of the Circle required.

The Area of the Circle may be also found by either of the following Rules.

RULE I.

SQUARE *the Diameter; multiply its Quadrature by* 11, *and divide the Product by* 14, *the Quotient is the Area.*

EXAMPLE.

LET the given Diameter be 15 Feet.

OPERA-

OPERATION.

$$
\begin{array}{lrl}
 & 15 & \\
 & 15 & \\
\hline
 & 75 & \\
 & 15 & \\
\hline
\text{Product} & 225 & \text{which is the Quadrature of the Diameter.} \\
\text{Now} & 225 & \\
\text{Multiplied by} & 11 & \\
\hline
 & 225 & \\
 & 225 & \\
\hline
\text{Divide by} & 14)2475(176\tfrac{11}{14} & \\
 & 14 & \\
\hline
 & 107 & \\
 & 98 & \\
\hline
 & 95 & \\
 & 84 & \\
\hline
 & 11 &
\end{array}
$$

Which is equal to the Area, according to EUCLID.

RULE II.

MULTIPLY ,7857, (*always, it being a fixt Number*) *by the Quadrature of the Diameter*, *and*

and then cutting off four Figures to the Right-hand, the Remains to the Left is the Area in whole Numbers, and those four Figures cut off is a Decimal Fraction.

EXAMPLE.

LET the Diameter be 15 Feet as before.

OPERATION.

```
        15
        15
        --
        75
       15
       ---
Product 225 which is the Quadrature of the Diameter.
```

```
Now the fixt Number   ,7857
multiplied by           225
                     ------
                      39285
                     15714
                    15714
                   --------
                   176,7825
```

Now, the last four Figures to the Right, being cut off by a *Comma*, the Remains to the Left, *viz.* 176, are whole Numbers, and the four Figures cut off, *viz.* 7825, is a Decimal Fraction; and so, the Area of the Circle is 176 Feet, and ,7825 Decimal Parts of a Foot, which are equal to 112 superficial Inches, and $\frac{68}{100}$ of an Inch.

To

To find the Number of ſuperficial Inches contained in any Decimal Fraction of a ſuperficial Foot.

RULE.

MULTIPLY *the Decimal Fraction by* 144, *the ſquare Inches in a ſquare Foot, and the Product being divided by the Decimal Denominator, the Product, cutting off from the Right, as many Figures as there be Places of Cyphers in the Denominator; the Remains,* (when any) *cut off to the Left, are Decimal Parts of an Inch.*

FOR, as the Denominator of the Decimal Fraction of a Foot,
Is to the Number of ſquare Inches in a ſquare Foot;
So is the Numerator of any Decimal Fraction
To the Number of ſquare Inches contain'd in that Fraction.

EXAMPLE.

As 10000, the Decimal Denominator,
Is to 144, the ſquare Inches in a ſquare Foot;
So is ,7825, the aforeſaid Decimal Fraction,
To 112 Inches and $\frac{68}{100}$.

OPERA-

OPERATION.

As 1000 : 144 : : ,7825 : 112 $\frac{68}{100}$|$\frac{00}{00}$

```
           144
         -----
         31300
        31300
        7825
        ------
       112,6800
```

PROB. VIII. Plate IV.

To find the Area of any Part of a Circle.

THE Parts of a Circle are distinguished from one another as follows, *viz.*

1st, IF a Circle be divided into two equal Parts, by a Diameter drawn through its Centre, as Figure A, each Part is called a Semicircle.

2dly, If a Semicircle be divided into two equal Parts, by a Perpendicular erected from the Centre on its Diameter as Fig. B. each Part is called a Quadrant.

3dly, If a Circle be divided into two unequal Parts by a right Line, as Fig. C, by the Line *a c*, then the Part *d* is called the lesser Segment, and the Part *e* the greater Segment.

4thly, If a Circle be divided into three Parts by two Right Lines parallel to its Diameter, as

Fig. D, by the Lines *a b*, *c d*, that Part of the Circle contained between thofe Lines, is called the Zone of that Circle, as being fimilar to the *Torrid Zone*, contained between the Tropics of *Cancer* and *Capricorn*.

5thly, If a Part of a Circle be contained between two Right Lines, down from its Center to its Circumference, and a Part of its Circumference, as *a b c*, Fig. F, fuch a Part is called *a Sector*, or the Sector of the Circle, and the Remainder of the Circle is called the Complement of the Sector.

THESE are the feveral Parts of a Circle, whofe Areas are found by the following Rules.

I. To find the Area of a Quadrant, having the Length of a Side given.

RULE. Fig. B. Plate IV.

1. *Find the Circumference of a Circle, whofe Diameter is equal to twice the given Side or Radius of the Quadrant.*

2. *Multiply the Side of the Quadrant by one 8th Part of the Circumference of the Circle, and the Product is the Area of the Quadrant.*

II. To find the Area of a Semicircle, having the Diameter given.

RULE. Fig. A.

Find the Area of one Half, as of a Quadrant, and double that Area.

OR,

Multiply Half its Circumference by Half its Diameter, and the Product is the Area.

III. To

III. *To find the Area of the Sector of a Circle, as a b c,* Fig. F. PLATE IV.

RULE.

As 1, is to $\frac{1}{2}$ the arch Line *a b*,
So is the Radius *a c*, to the Area:

THEREFORE,

Multiply *a c* the Radius, by *a d* half the Curve, and the Product is the Area required.

To find the Length (nearly) of the arched Line of the Segment of a Circle; as a c d, Fig. E. PLATE IV.

OPERATION.

Divide the Chord Line *a d* in four equal Parts; on the Point *a* with the Radius *a* 1 intersect the Curve *a c* in *b*; and draw the Line *b d*, which will be nearly equal to $\frac{1}{2}$ the arched Line *a c d*, as required.

IV. *To find the Area of the Segment of a Circle,* as *d*, Fig. C. PLATE IV.

RULE.

First, by Prob. I. Page 16, find the Centre *f*, and draw the Lines *a f*, and *c f*.

Secondly, by the last Rule, find the Area of the Sector *f a b c*; and then, the Area of the Triangle *a c f*, being substracted from the Area of the Sector, the Remains will be the Area of the Segment *a b c*, as required.

N. B. All plain Triangles are measured by these Rules, *viz.*

RULE I.

MULTIPLY *the whole Base (as* a c*) by half (* d f *) its Perpendicular, and the Product is the Area.* Or, *Multiply half the Base* a d *by (* d f *) all the Perpendicular, and the Product is the Area.*

RULE II.

MULTIPLY *the whole Base* a c, *by* d e *the whole Perpendicular, and half the Product is the Area required.*

V. *To find the Area of the Zone of a Circle.* Fig. D. Plate IV.

RULE.

From the Area of the whole Circle substract the two Segments *e* and *f*, and the Remains will be the Area of the Zone required.

PROB. IX.

TO *find the Area, or superficial Content of any Ellipsis.*

RULE I.

Multiply the Lengths of the conjugate and transverse Diameters together: The square Root of their Product is the Diameter of a Circle, whose Area is equal to the Area of the Ellipsis.

EXAMPLE.

Suppose the Length of the conjugate Diameter be 24 Feet, and the transverse 6 Feet: Then

Then 24
By 6

The Product is — 144, whose square Root 12, is the Diameter of a Circle, whose Area or superficial Content is equal to the Area or superficial Content of the Ellipsis; and which by the foregoing Rules will be found to be 113 $\frac{1}{7}$ Feet.

RULE II.

As 1, is to ,7854, so is the Quadrature of the two Diameters, to the Area.

EXAMPLE.

Suppose the Quadrature of the two Diameters be 144, as in Rule I. Then

1, : ,7854 : : 144 : 113,0976
144

31416
31416
7854

113,0976

Now, as the Area of every Ellipsis is a mean Proportional between the Areas of its circumscribing Circle, as *a b c d*, and its inscribing Circle, as *e f g h*. Fig. V. Plate IV.

Therefore

As the Area of the circumscribing Circle *a b c d*,

Is to the Area of the Ellipsis *a f c h*;
So is the Area of the said Ellipsis,
To the Area of the inscribed Circle *e f g h*.

PROB. X. Fig. IV. and V. Plate IV.
To measure the Segment of an Ellipsis, as the Segments A *and* B.

To measure the Segment *A.* Fig. V.

RULE.

As the Diameter *b d* of the circumscribing Circle,
Is to *f h* the conjugate Diameter of the Ellipsis;
So is the Area of the Circle's Segment *i c m*,
To the Area (*k c l*) of the given Segment of the Ellipsis, as required. And so in like manner,

To measure the Segment B. Fig. IV.

As the Area of the inscribed Circle *f e g h*,
Is to the Area of the Ellipsis *a e c h*;
So is the Area of the Segment *o e p* of the inscribed Circle,
To the Area of the given Segment *n e q*.

Or,

As *e h*, the Diameter of the inscribed Circle,
Is to *a c* the transverse Diameter;
So is the Area of the Segment *o e p*, of the inscribed Circle,

To

To the Area of the Segment *(n e q)* of the Ellipsis, required.

AND since that the Knowledge of the Extraction of the square Root is not only useful in the Mensuration of Ellipses, but also in many other important Affairs of Business; I will therefore, for a farther Entertainment, and for the better Instruction of young Students, enlarge this Digression, and shew, *how to extract the* SQUARE ROOT.

TO *extract the square Root of a given Number, is to find a mean proportional Number, between* 1 *and the Number given for Extraction.*

THAT is, it is to find a Number, whose QUADRATURE is equal to the given Number.

As for EXAMPLE.

If 36 be a given Number for Extraction, then the Work is, how to find the Number 6, which is called its Root, whose Quadrature 36 is equal to the given Number. And the manner of finding it, is called *extracting the square Root*.

A given Number for Extraction, is either *square* or *rational*, or *surd*.

A SQUARE or *rational Number*, is the Quadrature of some given Root, and therefore is always commensurable to its square Root.

Thus			And therefore			
1	Is the Quadrature of the square Root,	1		1	Is the square Root of	1	Single square Numbers.
4		2		2		4	
9		3		3		9	
16		4		4		16	
25		5		5		25	
36		6		6		36	
49		7		7		49	
64		8		8		64	
81		9		9		81	
100		10		10		100	Compound square Numbers.
121		11		11		121	
144		12		12		144	

All Quadratures or ſquare Numbers produced by the 9 Digits, are called ſingle ſquare Numbers, as 1, 4, 9, 16, 25, 36, 49, 64, and 81, as being each produced by the Multiplication or ſquaring of a ſingle Figure, as 1, 2, 3, *&c.* to 9; but all other Quadratures produced by the Multiplication or ſquaring of 10, 11, 12, *&c. viz.* the Quadratures 100, 121, 144, *&c.* are called compound ſquare Numbers

A *ſurd* Number is that, which is incommenſurable to its ſquare Root, and whoſe Root is inexplicable by Numbers, as 37, 82, 101, *&c.*

Now in order to extract the ſquare Root, it is to be obſerved,

Firſt, That all ſingle ſquare Numbers with their reſpective ſquare Roots, or Sides, are expreſt

exprest in the Third and Fourth Columns of the preceding Table.

Secondly, That when the Root of any Number less than 100 is required (which is not one of the single square Numbers exprest in the Table) you are to take for its Root, the Root of that single square Number in the Table which (being less) is nearest to the given Number. — So if it be required to find the square Root of 40; it would be found to be 6; because the greatest square Number in 40 is 36, whose Root is 6: And so the like is to be understood of all other Numbers, less than 100, not expressed in the Table, whose fractional Parts of their Roots, to be annexed, I shall shew how to find, after that I have taught how to extract the square Root of any compound square Number Arithmetically, as follows, *viz.*

I. To *extract the* Square Root of *any square Number.*

RULE I.

Point the Number given for Extraction as following, *viz.* place a Point over the first Figure towards the right Hand, and every other one towards the left.

Thus $\quad 1\dot{1}9\dot{0}2\dot{5}$

And

And herein NOTE, That the Figures thus distinguished, are called *Punctations* or *Points*; and as many such Points, as are contained in the Number given for Extraction, of so many Figures will the Root of that Number consist; provided the given Number be an exact compound square Number, because the square of any one single Figure never exceeds 2 Places.

RULE II.

Draw a curved Line on the right Hand of the Number given for Extraction (after the manner as is done in Division for to place the Quotient in) wherein the Root is to be placed.

Thus $\dot{1}1\dot{9}0\dot{2}5($

RULE III.

Find the greatest Square in the first Point towards the Left Hand (by the Table of single Square Numbers, which you must get by Heart, according to the School Phrase;) place its Root in the Quotient, and the Square under the first Point aforesaid, which substract from the first Point, and subscribe the Remains underneath it.

Thus,

$$\begin{array}{l} \dot{1}1\dot{9}0\dot{2}5\,(3 \\ \underline{9} \\ 2 \text{ Remainder.} \end{array}$$

Now

Now as the firſt Point to the Left is 11, and the greateſt ſquare Number therein is 9, whoſe Root is 3: Therefore place 3 in the Quotient, and 9 under 11, and then ſubſtracting 9 from 11, the Remains is 2.

RULE IV.

To the Remainder bring down the next Point, placing it on the Right Hand thereof, which is called the *Reſolvend.*

$$\dot{1}1\dot{9}0\dot{2}5\ (3$$
9::

———

Thus 290 Reſolvend.

RULE V.

Double the Quotient (or Root of the firſt Point) to wit 3, which doubled is 6, and place it on the Left Hand of the Reſolvend (as the Diviſor is placed in common Diviſion, diſtinguiſhed therefrom in the ſame manner by a curved Line) which is alſo called a Diviſor.

Thus,

$$\dot{1}1\dot{9}0\dot{2}5\ (3$$
9

———

The Diviſor 6)29,0 Reſolvend.

RULE VI.

Point off the laſt Figure of the Reſolvend towards the Right Hand by a Comma, and find how

how often the Divisor, or double Quotient 6, is contained in the remaining Figures of the Resolvend (to wit, in 29) which here is 4 Times, that is to say, 4 Times 6. Therefore place the Answer 4 in the Quotient, and also on the Right Hand of the Divisor.

Thus,

1190̇25̇ (34
9

Divisor 64) 29,0 Resolvend.

RULE VII.

Multiply the Divisor (6) with the Figure last added to it (4, which together is 64) by (4) the Figure last placed in the Quotient; and then substract the Product (256) from the Resolvend (290) and subscribe the Remainder (34.)

Thus,

1190̇25̇ (34
9

64) 29,0 Resolvend.
25 6 Product.

34 Remainder.

To the last Remainder (34) bring down the next Point (to wit, 25) for a second Resolvend (which is 3425) and then proceed therewith

with as with the first Resolvend, repeating the Work of the 5th, 6th and 7th preceding Rules, and continue so to do until the Extraction be finished, as following, *viz.*

First, Double the Quotient 34, *and it makes* 68, *which place on the Left of the new Resolvend.*

Thus,

$$\dot{1}1\dot{9}0\dot{2}5\ (34$$

9

64) 290 First Resolvend.
256 Product.

68) 342,5 Second Resolvend.

Secondly, Find how often the Divisor 68 is contained in the Resolvend, the last Figure to the right Hand being always excepted, to wit, in 342, and place the Answer (5) in the Quotient (making it 345) and also on the right Hand of the Divisor (68, making it 685 — as follows,

$$\dot{1}1\dot{9}0\dot{2}5\ (345$$

9

1st Divisor 64) 29,0 Resolvend.
25 6 Product.

2d Divisor 685) 343,5 Resolvend.
3425 Product.

0

3dly,

Thirdly, Multiply the Divisor 685, by (5) the Figure last placed in the Quotient, and substracting the Product from the Resolvend, subscribe the Remains, which in this Example is 0, which shews that the Extraction is finished, and that 119025 is an exact compound square Number, whose square Root is 345; because the Quadrature of 345 is 119025.

Note, That when the Divisor (with the last Figure added to it, as directed in RULE VII. multiplied by the Figure last placed in the Quotient) the Product exceeds the whole Resolvend, the Work is erroneous; and therefore at all such times a less Figure must be put in the Quotient, and to the Right of the Divisor; which being multiplied into the Divisor shall produce a Product next less than the whole Resolvend; and which being substracted from, it shall leave a Remainder less than the Divisor.

As for EXAMPLE,

Let 256 *be a square Number given for Extraction.*

$$\begin{array}{rl} \dot{2}5\dot{6} & \left(\begin{array}{l} 17 \text{ False} \\ 16 \text{ True} \end{array} \right\} \text{Root.} \\ 1 & \\ \hline 27)\ 15,6 & \text{Resolvend.} \\ 189 & \text{Product too great.} \\ \hline 26)\ 15,6 & \text{Resolvend removed.} \\ 156 & \text{Product.} \\ \hline 0 & \end{array}$$

Here the greateſt Square in the firſt Point 2, is 1, whoſe Root 1 I place in the Quotient, and its Remains 1 underneath it, and bring down and annex to the ſaid Remains the next Point 56, making it 156 for a Reſolvend, whoſe laſt Figure 6 to the Right, I point off as before ſhewn.

Now, the Double of 1 in the Quotient, being 2, I therefore place 2 for my Diviſor, on the Left of the Reſolvend, and find that it will go 7 times in 15; the Remains of the Reſolvend to the Left; wherefore, according to *Rule* V. I place 7 in the Quotient, and alſo on the Right of the Diviſor 2, making it 27.

Now 27 multiplied by 7, the laſt Figure in the Quotient, the Product is 189, which being greater than the Reſolvend 156, will not do; wherefore I place in the Quotient, and to the Right of the Diviſor, a leſs Figure, *viz.* the Figure 6, in the Place of the Figure 7, making the Quotient 16, and the Diviſor 26. Then multiplying the Diviſor 26 by 6, the laſt Figure placed in the Quotient, the Product is 156, which being equal to the whole Reſolvend, ſhews that the Extraction is compleated, and that the ſquare Root of 256, is 16. But had the above Product been yet greater than the Reſolvend, I muſt again have placed a leſs Figure, as 5, *&c.* in the

Plc

Places of the Figure 6, until the Product became equal to or less than the Resolvend.

It is also to be farther noted; That when the Remainder (after the Product is substracted from the Resolvend) is greater than the Double of the Figures then in the Quotient, which is the next Divisor; place a greater Figure in the Quotient, and to the Right of the Divisor, as is done in the second Example of the Extraction of Integers and Decimals, and then proceed to multiply, as in *Rule* VII.

Note also, That when the Divisor cannot be had in the Resolvend (according to *Rule* VII. which frequently will happen) then place a Cypher in the Quotient (as is done in common Division) and also on the Right Hand of the Divisor; and then to the Resolvend bring down and annex the next Point, for a new Resolvend, and then proceed as before.

This I will make plain and easy by the following Example.

Suppose 13017664 be a square Number given for Extraction:

13017664

13017664 (3608
9

1st Divisor 66)40,1 Resolvend.
396 Product.

2d Divisor 720) 57,6 Resolvend.

3d Divisor 7208) 5766,4 Resolvend.
57664 Product.

0 Remains.

Now, from the first Point 13 I substract 9, the greatest square Number therein, which Root 3, I have placed in the Quotient, and its Remains 4 underneath it.

To the Remainder 4, I bring down and annex the next Point 01, making it 401 for a Resolvend, and then doubling the Root 3 in the Quotient, which is 6, I place 6 on the Left of the Resolvend for a Divisor, and point off the last Figure of the Resolvend.

This *done*, I next examine, how often the Divisor 6 is contained in 40, the Remains of the Resolvend; and finding it to go 6 Times, I therefore place 6 in the Quotient, and on the right Hand of the Divisor 6, making it 66, which being multiplied by 6, the last Figure placed in the Quotient, the Product

396 being ſubtracted from the Reſolvend, the Remainder is 5, to which bring down and annex the next Point (76) for a new Reſolvend, which then will be 576.

This being done, begin as before, *viz.* Double the Quotient (36) which is 72, and which I place on the Left of the new Reſolvend for a ſecond Diviſor, and point off the laſt Figure of the Reſolvend as before.

And, as before, I examine how often the Diviſor 72 is contained in 57, the Remains of the Reſolvend; which being leſs than 72, I therefore place a Cypher in the Quotient, and alſo on the Right-hand of the Diviſor 72, making it 720.

This being done, I remove the Reſolvend with its Diviſor a Step lower, and bring down and annex to it the next Point 64, making it 57664, for a new Reſolvend, and point off its laſt Figure to the Right.

Now, as before, I examine how often the Diviſor 720 is contained in 5766, the Remains of the Reſolvend to the Left; and finding it to go 8 Times, I therefore place 8 in the Quotient, and alſo on the Right of the Diviſor 720, making it 7208, which I multiply by 8, the laſt Figure placed in the Quotient; and the Product 57664, being equal to the Reſolvend, the Extraction is therefore completed—and the ſquare Root of the Number given is 3608.

II. *To*

II. *To know when the square Root of a given square Number is truly extracted.*

RULE.

Multiply the Root into its self, whose Product must always be equal to the given Number for Extraction.

As for Example.

	3608	the above Root,
multiplied by	3608	
	28864	
	21648	
	10824	

the Product is 13017664, which is equal to the Number given for Extraction.

Or by common Division, as follows, viz.

Divide the square Number given for Extraction, by the square Root found; and the Quotient will be equal to the said Root, without a Remainder.

So 13017664 being divided by 3608, the Quotient is 3608, as before is proved by Multiplication.

To make the Extraction of the square Root as intelligible as I can in the Case last

mentioned, I will give a second Example, as follows, *viz.* Suppose 49126081 to be the given square Number whose Root is required:

		49126081(7009	
		49	
	14)	01,2	Resolvend.
A -	1400)	126081	Resolvend.
B -	14009)	12608,1	Resolvend.
		126081	Product.
		0	

Here 49, the first Point, being a square Number, and its Root 7; I therefore place 7 in the Quotient, and substracting 49 from 49, nothing remains; wherefore I bring down the next Point (12) for a Resolvend.

This done, I double the Quotient 7, which is 14, and place it on the Left of the Resolvend, and point off the last Figure to the Right of the Resolvend, so that its Remains to the Left is but 1.

Now as 14 the Divisor cannot be had in 1, the said Remains of the Resolvend, therefore I place a Cypher in the Quotient, and also another on the Right-hand of the Divisor (after having removed the Resolvend a Step lower) making it 140 (as against A) and to the Resolvend 12 bring down and annex the next Point 60, making the new Resolvend 1260, and point off its last Figure to the Right as before; so then the Remains of the Resolvend to the Left is 126.

Now

Now again, as 140 the Divisor cannot be had in 126 the said Remains of the Resolvend, I must therefore place another Cypher (as before) in the Quotient, and also on the Right of the Divisor 140, making it 1400, and bring down and annex to the Resolvend 1260 the next Point 81, thereby making it 126081, from which I point off the last Figure to the Right as before, and then the Remainder of this new Resolvend to the Left is 12608.

In the next Place, I examine by common Division, how often the Divisor 1400 is contain'd in the said Remainder of the Resolvend 12608; which being 9 Times, I therefore place 9 in the Quotient, and also on the Right of the Divisor 1400, making it 14009, as at B.

Then multiplying the Divisor 14009, by 9 the last Figure placed in the Quotient, the Product is 126081; which being equal to the Resolvend, shews that the Extraction is completed, and that the square Root of 49126081 is 7009.

Thus much for the Extraction of square Numbers, which consist of whole Numbers or Integers only. Now I shall, in the next Place, shew how to extract the square Root of square Numbers, which consist of Integers and Decimal Fractions only.

III. *To extract the square Root of any square Number, consisting of Integers and a decimal Fraction.*

RULE.

POINT *the Integers of the given Number to be extracted from the Right to the Left, as before: and the Figures of the Fraction, from Units, place (of the Integers) towards the Right; and as many Points as are in the Fraction, of so many Places will its Root consist, and which, when the Extraction is ended, (which is the very same as if the whole were Integers) must be separated from the Integers by a Comma.*

EXAMPLE.

Suppose 4495,7025 be a square Number for Extraction:

```
           4495,7025(67,05   Root
           36
           --
     127)  89,5    Resolvend
           889     Product
           ---
    13405)67025    Resolvend
          67025    Product
          -----
              0
```

Now, the Quotient being 6705, and the Fraction consisting of two Points, therefore the Root of the Fraction consists of two Places; which

which ſeparate from the Integers by a *Comma* thus, 67,05, and then the Work is done.

SECONDLY, *To extract the ſquare Root of a decimal Fraction, which is commenſurable to its Root.*

To perform this, proceed in every Reſpect as in the Extraction of Integers, placing a *Comma* before the Root, to ſignify that 'tis a decimal Fraction; which the two following Examples will make plain.

Suppoſe ,5625 and ,571536 to be two given decimal Fractions, commenſurable to their Roots:

EXAMPLE I.

,5625(,75 Root
49
—
145) 72,5 Reſolvend
725 Product
—
0

EXAMPLE II.

,571536(,756Root
49
—
145) 81,5 Reſolvend
725 Product
—
1506) 9036 Reſolvend
9036
—
0

In the Extraction of decimal Fractions, which have two or three Cyphers in the two or three, *&c.* firſt Places next the Left-hand, you muſt always *Note*, *to cut off as many two's of them, with a Daſh of your Pen, as are there contained*; and for every ſuch two Cyphers ſo

cut off, place a Cypher in the Quotient, or first Place or Places of the Root, and then proceed to extract the square Root of the remaining Figures, as if they were Integers.

Thus the square Root of ,004489 is ,067, and the square Root of ,0000351649 is ,00593, as in the following Examples.

EXAMPLE I.	EXAMPLE II.
,00|4489(,067	,0000|351649(,00593
36	25
127) 88,9 Resolvend	109) 1016 Resolvend
889 Product	981 Product
0	1183) 354,9
	3549
	0

N. B. *When a Vulgar Fraction, instead of a Decimal Fraction, is annexed to a given Number, commensurable to its Root, reduce the vulgar Fraction to a decimal Fraction, and then proceed as in the preceding Examples.*

VULGAR FRACTIONS are reduced to *Decimal Fractions,*

By this ANALOGY,

As the Denominator of a vulgar Fraction, is to its Numerator,

So is 10,100, &c. *the Denominator of a Decimal Fraction to its Numerator.*

Suppose

Suppose $\frac{3}{4}$ be a given vulgar Fraction, to be reduced to a decimal Fraction, whose Denominator is 100.

Then 4 : 3 : : 100 : 75.

$$\begin{array}{r} 3 \\ \hline 4)300(75 \\ 28 \\ \hline 20 \end{array}$$

So the decimal Fraction, equal to $\frac{3}{4}$ *is* ,75; with which proceed as before.

N. B. In the Extraction of Integers and Decimals annexed, and Decimals alone, that if the Number of decimal Places be not even, *viz.* of Two, Four, Six, *&c.* Places, then the Number proposed for Extraction is incommensurable to its Root, and is therefore called a *surd Number*, as I have observed already.

IV. *To extract the square Root of a vulgar Fraction alone, commensurable to its Root, as* $\frac{1}{4}$, $\frac{1}{9}$, $\frac{1}{16}$, *&c.*

RULE.

Extract the square Root of the Numerator of the given Fraction, for a new Numerator, and also of the Denominator, for a new Denominator; then shall the new Fraction (so produced) be the square Root of the given Fraction.

Let

Let $\frac{1}{4}$, the first of the Fractions which I just now mentioned, be a given square Fraction to find its Root. Now,

The square Root of 1 the Numerator, is 1, which is the new Numerator; and the square Root of 4 the Denominator, is 2, for the new Denominator; wherefore the new Fraction $\frac{1}{2}$, is the square Root of $\frac{1}{4}$, the given square Fraction.

As in Extractions of this kind, the Root of a square Fraction is greater than the Fraction itself, which may be surprizing to some, I will therefore demonstrate the Reason thereof.

Demonstration.

Suppose the Square *a b c d*, *Fig.* I. *Plate* IV. be a square Integer, divided into 4 equal Parts by the two Diameters *e x* and *y g*; then 'tis plain that the little Square *e b f g* is a quarter Part thereof, and equal to $\frac{1}{4}$, the given Fraction.—Now as *e b*, which is the Side or Root of the Square *e b f g*, is Half the Side *a b*, of the Integer *a b c d*, therefore the square Root of $\frac{1}{4}$ is $\frac{1}{2}$; that is, it is not $\frac{1}{2}$ of the given Fraction, but 'tis $\frac{1}{2}$ the Length of the Side of the Integer, of which the given Fraction is a quarter Part.

So in *Fig*. II. *Plate* IV. the square Root of the Square *i k l m*, which is $\frac{1}{9}$ of the Square *h k n o*, is $\frac{1}{3}$; that is to say, 'tis $\frac{1}{3}$ of *h k*, the Side of the Integer *k h n o*.

And

And in *Fig.* III. *Plate* IV. the square Root of the Square *r q s t*, which is $\frac{1}{16}$ of the Integer *p q v w*, is $\frac{1}{4}$; that is to say, 'tis $\frac{1}{4}$ of *p q*, the Side of the Integer *p q v w*, of which *r q s t*, the square Fraction given, is a sixteenth Part.

V. *To extract the square Root of a surd Number (as near as need be in common Affairs.)*

RULE.

Find the square Root of the Number given for Extraction, as if it was commensurable to its Root, and then express the Root of the Remainder by a vulgar Fraction, as follows; viz. *Double the Remainder for a Numerator, and quadruple (which is to multiply by 4) the Root found, and thereto add 1 for the Denominator. Then that vulgar Fraction being annexed to the Root found, that mixt Number shall be (nearly) the square Root of the given Number.*

Suppose 18 to be a Number given for Extraction.

18(4, $\frac{4}{17}$ Root
16
—
2 remains.

Here the Root of the integral Part is 4, and 2 is the Remains—Now the Double of 2, the Remains, is 4, which is the Numerator: and the

the Root 4 quadrupled, 16, and 1 added to it is 17, is the Denominator; and so $4\frac{2}{17}$ is very near the square Root of 18.

$$\begin{array}{rl} \text{For} & 4\frac{2}{17} \\ \text{Multiplied by} & 4\frac{2}{17} \times \\ \hline & 16 — \frac{16}{17} \\ & \quad \frac{16}{17} — \frac{16}{17} \\ \hline \end{array}$$

The Product is $17 — \frac{15}{17} —— \frac{16}{177}$, which is little more than $\frac{1}{17}$ less than the true Root.

N. B. *When very great Exactness is required, the square Roots of surd Numbers may be obtained much nearer by an Approximation, as follows,* viz.

When a surd Number is given for Extraction, consisting wholly of Integers, you must proceed in the Extraction, the very same, as with a rational square Number, till all the Points are finished, when there will always be a Remainder; which not only shews that the Number proposed is a surd Number, but also, that you have already found the greatest whole Number that the square Root can consist of: And to find the decimal Fraction to be annexed to the Root so found, to bring it nearer the Truth, proceed as follows.

RULE.

Place two Cyphers on the Right-hand of the Remainder, for a new Resolvend, and double the Roo-

Root found for a new Divisor, wherewith proceed, as in RULE VI. *and* VII. *and then there will be produced one Figure more to be placed in the Quotient, which is the first Figure of the decimal Fraction, and which you must distinguish from the Integers in the Root, by a* Comma; *and so by a continual annexing of two Cyphers to every last Remainder, you may continue the Extraction to as many Places of Decimals as you please; for as many Pairs of Cyphers as you annex, so many Places of Decimals will there be in the Root.*

EXAMPLE.

What is the square Root of 6968(83,4745, &c.
64

163) 568 Resolvend
489 Product

Remains 79

Now to 79 add two Cyphers, &c.

1664)790,0 new Resolvend
6656 Product

16687)12440,0 new Resolvend
116809 Product

166944) 75910,0 Resolvend
667776 Product

1669485) 913240,0 Resolvend
8347425 Product

Remains 784975, &c.

Now

Now in this Example you see, that I have added a Pair of Cyphers to the Remainder 4 Times, and thereby obtained as many Places of Decimals in the Root; and so in like manner you may go on until you have a Decimal of a Hundred, Thousand, &c. Places, and still have a Remainder.

In the Extraction of surd Numbers, consisting of Decimals annexed to Integers, or of Decimals alone, it is to be observed, that if the decimal Places be not even, as Two, Four, Six, &c. they must be made so, by annexing a Cypher. So if ,751 be a given Decimal for Extraction, you must make it ,7510; and in like manner the decimal Fraction ,6 must be made ,60, &c. before they be pointed for Extraction.

V. *To prove the Extraction of Surd Numbers.*

The Extraction of surd Numbers is best proved by squaring the Root found; and if the Product, with the Remains added, be equal to the Number extracted, the Operation is true, otherwise not.

This I will make familiar and easy, by a Proof of the last Example,

$$\text{whose}\begin{cases}\text{given Number is } 6968\\ \text{Root found is } 83{,}4745\\ \text{Remainder is } 784975\end{cases}$$

As

As following.

```
Multiply 83,4745 the Root
by itself 83,4745
          -------
          4173725
         3338980
        5843215
       3338980
      25·0·4235
     6677960
     -------------
     6967992I5025 Product
           784975 Remainder
     -------------
```

Product is 696 8,00000000 ; which is equal to the given Number.

And as I have work'd the Proof of this Example by decimal Multiplication, which perhaps may not be well underſtood by all my Readers, I will therefore, for the well underſtanding of it, beg Leave to obſerve,

I. In the Multiplication of Decimals (whether the Numbers be Decimals alone, *or* Integers and Decimals) that after having placed the Multiplier under the Multiplicand, as in common Multiplication, the Work is, in every reſpect, the ſame as with Multiplication of whole Numbers of one Denomination ; diſtinguiſhing from the Right-hand of the Product *ſo many* Figures for Decimals, as there are decimal Places both in the Multiplicand and Multi-

Multiplier, and then the Remains to the Left-hand (when any) are whole Numbers.

II. In the Multiplication of Decimals alone (that is, when the Multiplicand and Multiplier are each leſs than an Unit) the Product thence ariſing is always leſs than either of them; and therefore it often happens, that after Multiplication is finiſhed, there are not ſo many Figures in the Product, as there are decimal Places in the Multiplicand and Multiplier; wherefore when ſuch Defect happens, it muſt be obſerved to prefix as many Cyphers on the Left-hand of the Product, as will make the Number of decimal Places in the Product, equal to the Number of decimal Places in both the Multiplicand and Multiplier. Theſe will be beſt underſtood by the following Examples, *viz.*

Example I.		Example II.	
Multiply	72,5	Multiply	62,25
by	18,7	by	3,75
	5075		31125
	5800		43575
	725		18675
	1355,75		233,4375

Example

Example III.	Example IV.
Multiply 2,724	Multiply 9,7654
by 2,124	by 8,6923
10896	292962
5448	195308
2724	878886
5448	585924
	781232
5,785776	84,88378642

In Examp. I. there being but two Places of Decimals, *viz.* 5 and 7, therefore from the Product 135575 (by a *Comma)* I separate the two last Figures thereof, *viz.* 75, so that the true Product is 1355,75.

In Examp. II. there being 4 Places of Decimals, *viz.* 25 and 75, therefore from the Product 2334375, I separate the last 4 Figures to the Right, *viz.* ,4375, and then the real Product is 233,4375.

So in like manner, the Decimal in the Product of Examp. III. consists of 6 Figures, because there are 6 decimal Places in the Multiplicand and Multiplier; and the Decimal in the Product of Examp. IV. consists of 8 Figures, because there are so many decimal Places in the Multiplicand and Multiplier, *viz.* ,7654 and ,6923.

Now I will give two Examples, wherein there don't arise so many Figures in the Products as there are decimal Places in the Multiplicand and Multiplier, which must be made good by prefixing of Cyphers, as aforesaid.

EXAMPLE I.

Multiply ,09
by ,05

,0045 Here I must prefix two Cyphers, as the two Decimals consist of 4 Places, and their Multiplication produces but 2 Figures, *viz.* 45.

EXAMPLE II.

Multiply ,0075
by ,075

375
525

,0005625 Here I must prefix 3 Cyphers, because the Multiplication of the two Decimals produce but 4 Figures, *viz.* ,5625.

It *is also to be noted*,

That when a decimal Fraction, or whole Numbers with Decimals annexed, is to be multiplied by 10, 100, 1000, *&c.* Units, it is but removing the *Comma* so many Places farther towards the Right-hand in the Multiplicand, as there are Cyphers annexed to the One.

As

As for EXAMPLE.

If ,8763 be multiplied by

10	The Product will be	8,763
100		87,63
1000		876,3
10000		,8763

Now, as I have thus fully explained the Extraction of the ſquare Root in all its Varieties, of whole Numbers and Fractions; I ſhall in the next Place, for to ſave the Trouble of Extractions, add a Table of ſquare Numbers with their Roots, from 1 to 250,000, and then return to the Menſuration of Cylindrical Walls, *&c.*

A TABLE *of Square Numbers and their Roots.*

Root.	Square.	Root.	Square.	Root.	Square.
1	1				
2	4	31	961	60	3600
3	9	32	1024	61	3721
4	16	33	1089	62	3844
5	25	34	1156	63	3969
6	36	35	1225	64	4096
7	49	36	1296	65	4225
8	64	37	1369	66	4356
9	81	38	1444	67	4489
10	100	39	1521	68	4624
11	121	40	1600	69	4761
12	144	41	1681	70	4900
13	169	42	1764	71	5041
14	196	43	1849	72	5184
15	225	44	1936	73	5329
16	256	45	2025	74	5476
17	289	46	2116	75	5625
18	324	47	2209	76	5776
19	361	48	2304	77	5929
20	400	49	2401	78	6084
21	441	50	2500	79	6241
22	484	51	2601	80	6400
23	529	52	2704	81	6561
24	576	53	2809	82	6724
25	625	54	2916	83	6889
26	676	55	3025	84	7056
27	729	56	3136	85	7225
28	784	57	3249	86	7396
29	841	58	3364	87	7569
30	900	59	3481	88	7744

Root.	Square.	Root.	Square.	Root.	Square.
89	8121	119	14161	149	22201
90	8100	120	14400	150	22500
91	8281	121	14641	151	22801
92	8464	122	14884	152	23304
93	8649	123	15129	153	23409
94	8836	124	15376	154	23716
95	9025	12	15625	155	24025
96	9216	126	15876	156	23336
97	9409	127	16129	157	24649
98	9704	128	16384	158	24964
99	9801	129	16641	159	25281
100	10000	130	16900	160	25600
101	10 01	131	17161	161	25921
102	10404	132	17424	162	26244
103	10609	133	17689	163	26569
104	10816	134	17956	164	26896
105	11025	135	18225	165	27225
106	11236	136	18496	166	27556
107	11449	137	18769	167	27889
108	11664	138	19044	168	28224
109	11881	139	19321	169	28561
110	12100	140	19600	170	28900
111	12321	141	19881	171	29241
112	12544	142	20164	172	29784
113	12769	143	20449	173	29929
114	12996	144	20736	174	30276
115	13225	145	20025	175	30585
116	13456	146	21316	176	30776
117	13689	147	21609	177	31329
118	13924	148	21904	178	31684

Root.	Square.	Root.	Square.	Root.	Square.
179	32041	208	43264	237	56169
180	32400	209	43681	238	56644
181	32761	210	44100	239	57121
182	33124	211	44521	240	57600
183	33489	212	44944	241	58081
184	33856	213	45369	242	58564
185	34025	214	45796	243	59049
186	34596	215	46225	244	59536
187	34969	216	46656	245	60025
188	35344	217	47089	246	60516
189	35621	218	47524	247	61009
190	36100	219	47961	248	61504
191	36481	220	48400	249	62001
192	36864	221	48841	250	62500
193	37249	222	49284	251	62901
194	37636	223	49729	252	63504
195	38025	224	50176	253	64009
196	38426	225	50625	254	64516
197	38809	226	51076	255	65025
198	39204	227	51529	256	65536
199	39601	228	51984	257	66049
200	40000	229	52441	258	66564
201	40401	230	52900	259	67081
202	40804	231	53361	260	67600
203	41209	232	53804	261	68121
204	41616	233	54289	262	68644
205	42025	234	54756	263	69169
206	42436	235	55225	264	69696
207	42849	236	55696	265	70225

Root.	Square.	Root.	Square.	Root.	Square.
266	70756	296	87616	326	106276
267	71289	297	88209	327	106929
268	71824	298	88804	328	107584
269	72361	299	89401	329	108241
270	72900	300	90000	330	108900
271	73341	301	90601	331	109561
272	73984	302	91204	332	110224
273	74529	303	91809	333	110889
274	75076	304	92416	334	111556
275	75625	305	93025	335	112225
276	76176	306	93636	336	112896
277	76729	307	94249	337	112469
278	77284	308	94864	338	114244
279	77771	309	95481	339	114921
280	78400	310	96100	340	115600
281	78961	311	96721	341	116281
282	79524	312	97344	342	116964
283	80089	313	97969	343	117649
284	80656	314	98596	344	118336
285	81225	315	99325	345	119025
286	81796	316	99856	346	119716
287	82369	317	100489	347	120409
288	83144	318	101124	348	121104
289	83521	319	101761	349	121801
290	84100	320	102400	350	122500
291	84681	321	103041	351	123201
292	85264	322	103684	352	123904
293	85849	323	104329	353	124609
294	86436	324	104976	354	125316
295	87025	325	105625	355	126025

Root.	Square.	Root	Square.	Root.	Square.
356	126736	385	148225	414	171396
357	127449	386	148996	415	172225
358	128164	387	149769	416	173056
359	128881	388	150544	417	173889
360	129600	389	151321	418	174724
361	130321	390	152100	419	175561
362	131044	391	152881	420	176400
363	131769	392	153664	421	177241
364	132496	393	154449	422	178084
365	133125	394	155236	423	178929
366	133956	395	156025	424	179776
367	134689	396	156816	425	180625
368	135424	397	157609	426	181476
369	136161	398	158404	427	182329
370	136900	399	159201	428	183184
371	137641	400	160000	429	184041
372	138384	401	160801	430	184900
373	139129	402	161604	431	185761
374	139806	403	162409	432	186624
375	140625	404	163216	433	187489
376	141376	405	164025	434	188356
377	142129	406	164836	435	189225
378	142884	407	165649	436	190096
379	143641	408	166465	437	190960
380	144400	409	167281	438	191844
381	145161	410	168100	439	192721
382	145924	411	168921	440	193600
383	146789	412	169744	441	194481
384	147456	413	170569	442	195364

Root.	Square.	Root.	Square.
443	196249	472	222784
444	197136	473	223729
445	198025	474	224876
446	198916	475	225625
447	199809	476	226576
448	200704	477	227429
449	201601	478	228484
450	202500	479	229441
451	203301	480	230400
452	204304	481	231381
453	205209	482	232324
454	206116	483	233289
455	207025	484	234256
456	207936	485	235225
457	208849	486	235996
458	209564	487	237169
459	210681	488	238144
460	211600	489	239121
461	212521	490	240100
462	213444	491	241081
463	214369	492	242064
464	215296	493	243049
465	216925	494	244036
466	217156	495	245025
467	218089	496	245916
468	219024	497	247009
469	219961	498	248004
470	220900	499	249001
471	221841	500	250000

PROB.

PROB. XI. *To measure the Solidity of a circular or elliptical Wall.* As Fig. IV. Plate. II. *whose Thickness, from the Bottom to the Top, is the same.*

RULE.

FROM the Area of the exterior Circle *i k l m*, subtract the Area of the interior Circle *a c e g*, and the Remains will be the Area of the Plan or Base of the Wall; which multiply by the Height, and the Product will be the Solidity in cube Feet, and which being divided by 306, the Number of cube Feet in a Rod, the Quotient will be Rods, and the Remains (when any) cube Feet.

And so in like manner,

The Solidity of an elliptical Wall, as Fig. IV. Plate III. *may be found thus*, viz.

FROM the Area of the Ellipsis 1, 2, 3, 4, subtract the Area of the Ellipsis *a b c g*, and the Remains will be the Area of the Plan of the Wall; which multiply by the Height, &c. as aforesaid.

EXAMPLE.

SUPPOSE *the Circle* Fig. IV. Plate II. *to be 28 Feet Diameter in the Clear within, and the Wall to be 4 Bricks length in Thickness, and 25 Feet in Height, what's the Content of that Wall?*

NOW, as the Thickness of the Wall is 4 Bricks, equal to 3 Feet; therefore to 28 Feet, the

the given Diameter, add 6 Feet for the two Thickneſſes of the Walls on each Side, and the Sum 34 will be equal to the Diameter of *i k l m*, the exterior Circle.

By Prob. VII. Page 170, find the Areas of the exterior and interior Circles, which will be found to be, for the Exterior, — $908\frac{4}{7}$
and for the Interior, — — 616

whoſe Difference — — $292\frac{4}{7}$
is the Area or Number of ſuperficial Feet, on which the Wall ſtands; and which being multiplied by 25 Feet, the given Height, the Product 7303 being divided by 306, the Quotient will be 23 Rods and 265 cube Feet, which is the ſolid Content required.

N. B. The Solidity or Content of circular Walls, may be alſo found as follows.

RULE.

1. Add together in one Sum the Number of Feet contained in the Girts or Circumferences of the exterior and interior Circles, or Arches of the Plan; and then their half Sum being multiplied by the Thickneſs of the Wall, the Product will be the Area of the Plan.

2. Multiply the Area of the Plan, by the Height (of the firſt Thickneſs) and the Product will be the Solidity of that Part in cube Feet.

N. B.

N. B. When a Wall is built of different Thickneſſes, this Rule muſt be repeated at every Thickneſs, after the firſt; and then the ſeveral Solidities being added together, and divided by 306, as aforeſaid, the Quotient will be the Solidity required.

In the preceding Example, the Circumference of the exterior Circle is $106\frac{2}{7}$ Feet, and the Circumference of the interior Circle is 88 Feet, whoſe Sum is $194\frac{6}{7}$, and whoſe Half is $97\frac{3}{7}$. Now $97\frac{3}{7}$ being multiplied by 3 Feet, the Thickneſs of the Wall, the Product $292\frac{2}{7}$ is the Area or Number of ſuperficial Feet on which the Wall ſtands; which is but $\frac{1}{7}$ of a Foot more than in the preceding Example.

Sect. X. *Of* Arches *to* Vaults, *of* Cellars, Ground Offices, Bridges, Drains, *&c.*

As circular Walls are called *Erect Arches*, as being perpendicular to the Horizon, ſo the Arches of Vaults are called *Horizontal Arches*, as being parallel to the Horizon.

Horizontal Arches are either *Circular*, *Elliptical*, or *Gothick*.

Cir-

CIRCULAR ARCHES are either Semi-circles or leſs than a Semi-circle, called *Scheme Arches.*

ELLIPTICAL ARCHES are Semi-ellipſes, either on their tranſverſe Diameters, as Fig. III. or on their conjugate Diameters, as Fig. II. Plate IX.

GOTHICK ARCHES are alſo of two Kinds, viz. *Ox-Ey'd*, as Fig. II. and III. Plate XI. or *Hanch'd*, as Fig. I. and II. Plate XII.

THE Arches of Vaults are either continued entire from End to End, or interſected at right or oblique Angles, with one or more other Arches: which together, are then call'd *Groin'd Arches.*

IN all Kinds of arched Vaults, the Prices of Bricks and Mortar are the ſame, as in other common Works, but the Price of Workmanſhip is more; *viz.* For continued ſtraight Vaults, *Work and Half*; and for groin'd Vaults, *Double Work*, excluſive of cutting the Angles: And therefore ſtraight continued Vaults, jointed in the common Way, are worth for the Workmanſhip 2 *l.* 5 *s.* and groin'd Vaults 3 *l. per Rod*, excluſive of 6 *d. per* Foot for cutting the Angles, as aforeſaid.

IN the building of Arches, great Care ſhould be taken, that no *Samel* Bricks be uſed

 therein,

therein, which in large Works will *cruſh*, and thereby cauſe the Work to fall down.

And it muſt alſo be obſerved, that every Courſe of Bricks be kept from *ſommering* more than a right Angle from the Surface of the Centre; for when they are ſuffered ſo to do, the keying-in Courſes on the Crown not having any *Skew Back*, or *Wedge Property*, on which the Strength of all Arches depend, will inevitably fall.

In the Turning of Arches, it is always adviſable, to lay the Bricks next to the Centre as thin in Mortar as can be done, and to firmly wedge up their upper Ends with *Tile Sheds*, or thin *Slate Sheds*, rather than to work them up with Mortar only, which in its Conſolidating will ſhrink conſiderably, and thereby, *at the ſtriking of* the *Centre*, admit of ſome Settlement.

Almost every arched Vault has a lateral Preſſure, more or leſs, according to the Nature of the Curve of which its Arch is formed; and therefore it is, that ſufficient Abutments to reſiſt ſuch Preſſure are required.

SECT. XI. *Of the* ABUTMENTS *of* BRICK ARCHES.

FOR the better underſtanding the Nature of the Preſſure and Abutments of Circular, Elliptical, and Gothick Arches, it will be beſt for to firſt explain the Preſſure and Abutment of that, which (tho' very improperly) is called a *ſtraight Arch*, as Fig. I, II. Plate V. whoſe Courſes being in Fact nothing more than a Complication of ſo many Fruſtums of Wedges, their lateral Preſſure is therefore beſt accounted for, by conſidering one half of an entire Arch as a right-angled Wedge, and its Weight, as a Power applied thereto.

THE Power of the Wedge is found by the following Rule, *viz.*

As its perpendicular Height
is to the Length of its Baſe,
So is the Power applied
to the Weight it will equipoiſe.

OR,

So is the Action of the Power applied, to the Re-action of the Body, on which it acts. Wherein 'tis to be noted,

That the more acute-angled a Wedge is, the greater is its Power.

IN

In the following Calculations of the Abutments of Brick Arches, it is ſuppoſed, that the material Matter of themſelves, and of their Abutments, are of the ſame Compactneſs, Gravity, and Depth or Thickneſs; and therefore the Areas of their Faces being only conſidered, without Regard being had to their Depths, will be ſufficient.

Prob. I. Fig. I. Plate V.

The half Part of a ſtraight Arch, as a b c d, being given, to find the Length of its Jaumb, whoſe Breadth ſhall be equal to the Height of the Arch, and whoſe Reſiſtance or Re-action at the ſkew Back, which is to contain 45 Degrees, ſhall be equal to the Power or Preſſure of the half Arch.

Operation.

As *b c*, 4 Ft. 6 Inch. (the Top of the half Arch, which is conſidered as the Perpendicular of a Wedge;) is to *b e* 4 Ft. 6 Inch. the Diſtance from the Head of the Arch to its Centre (which is conſidered as the Baſe of a Wedge;) ſo is 5 Ft. 7½ Inch. the Area *b c a d* of Half the Arch; which is to be conſidered as a Power applied to 5 Ft. 7½ Inch. the Area of *c d f g*, the abutting Jaumb; and as the Breadth of the Jaumb and Height of the Arch are equal, and as the Area of the abutting Jaumb is found to be equal to the Area of the half Arch, therefore making *c g* equal to *b c*, the Length *c g* will be

be the Length of the Jaumb required, and which will resist the half Arch *b c a d*, with the same Power as the half Arch presses on it: For as the Action and Re-action of the Triangles *b c e*, and *c e g* are equal, therefore the Action and Re-action of the two Remains, (*viz.* the two Trapezoids *b c a d*, and *c d f g*, which are the half Arch) and the abutting Jaumb are also equal, as required. And as I have already observed, that the more acute a Wedge is, the greater is its Power; therefore in all straight Arches, the less the Skew-back is, the greater the Abutment must be.

DEMONSTRATION.

IN Fig. I. where the Skew-back is 18 Inches, the Area of the abutting Jaumb is 5 Ft. $7\frac{1}{2}$ Inch. But in Fig. II. where the Skew-back is 9 Inches, the Area of its abutting Jaumb must be $10\frac{1}{4}$ Feet, which is nearly double the other.

FOR in Fig. II. as *ab*, 3 Ft. 9 Inch. is to *a c*, 7 Ft. 6 Inch. so is 5 Feet the Area of *a b d e* the half Arch, to 10, the Area of its abutting Jaumb.

AND tho' in Fig. I. the Breadth of the abutting Jaumb is made equal to the Height of the Arch, for the sake of making the Demonstration clear, yet their Breadths or Heights are to be made at Pleasure as Occasions may require; but either their Height must be given to find the Breadth, or the Breadth to find the Height; which are both found as follows, *viz.*

Prob. II. *The Area and Height of an abutting Jaumb of a ſtraight Arch being given, to find the Breadth:*

Let the given Area be 10 ſuperficial Feet, and the Height of the abutting Jaumb 6 Feet.

RULE.

Divide (10) the given Area, by (6) the given Height, and the Quotient ($1\frac{2}{3}$) is the Breadth required.

Prob. III. *The Area and Breadth of an abutting Jaumb to a ſtraight Arch being given, to find its Height:*

Let the given Area be 10 Feet as before, and the given Breadth 18 Inches (equal to the Height of the Arch.)

RULE.

Divide (10) the given Area, by ($1\frac{1}{2}$,) and the Quotient ($6\frac{2}{3}$) is the Height of the abutting Jaumb, as required.

N. B. When the re-acting Area of an abutting Jaumb is found, it is neceſſary to make ſome Addition thereto, ſo that the re-acting or reſiſting Area of the abutting Jaumb, may be ſuperior to the acting or preſſing Area of the half Arch: And therefore in Fig. I. add the Area of the Triangle *c d i*, and in Fig. II.

the

the Area of the Trapezoid *b x e z*, to the Areas of the abutting Jaumbs, and then the Arches cannot remove their Jaumbs, unleſs they are loaded with Weights of greater Power.

When a ſtraight Arch, as *a d*, Fig. I. Plate VI. muſt ſuſtain Weight as the Parallelograms A and B, then the Breadth of its abutting Piers, as *e a* and *d b*, muſt be made each equal to *d c*, the Height of the Parallelograms, and their Depths *d i* and *a g*, to *a n*, half their Length: Becauſe then the abutting Piers C and D, will be equal in Area and Re-action, to the Area and Action of the Weight or Parallelograms A and B.

For as *n d* the Perpendicular, is to *n m* the Baſe of the right-angled Wedge *n d m*, ſo is the Area of the Parallelogram B, together with the Area of the half Arch, to the Area of the abutting Jaumb G, and of the abutting Pier D: And therefore if to the abutting Piers C D, be added any Parts of the geometrical Squares E and F, their Power of Reſiſtance will then be ſuperior to the preſſing Power of A B, the Weight on the Arch, which therefore cannot fall.

When a ſtraight Arch, with its abutting Piers, are to ſuſtain Weight, as Fig. II. and III. Plate VI. then the Breadth of its abutting Piers *a b* and *d e*, muſt be made (at leaſt)

each equal to half the Extent of the Head of the Arch, *viz.* to *b c:* Becauſe then the Area of the Pier A C will be greater than the Area of the Weight B, and its repulſive Force will conſequently be ſuperior to the preſſing Force of the Weight; ſo that if the Weight and Piers were to be raiſed together infinitely, the Arch could not in the leaſt be affected thereby.

THUS much for the Abutments of ſtraight Arches; now for thoſe of a ſemicircular Arch.

THE ſemicircular Arch for its Uniformity, is very much uſed, where Height will admit it; but where it will not, then a ſemi-elliptical Arch, on the tranſverſe or long Diameter, muſt be ſubſtituted in its Place, as alſo muſt a ſemi-elliptical Arch on the Conjugate, or ſhort Diameter, when a ſemi-circular Arch will not riſe to a Height required.

ALL Kinds of ſemi-circular, ſemi-elliptical, and Gothick Arches, are divided into three Parts, namely, two Hanches, as B B, Fig. I. Plate VII. and the ſcheme Part A A, contained between them.

THE two Hanches of a ſemi-circular Arch contain 90 Degrees, *viz.* each 45 Degrees, and the Scheme Part 90 Degrees more, which together make 180 Degrees.

IN

In all ſemi-circular Arches, whoſe Spandrels are to be work'd up level with their Crowns, as Fig. I. and II. Plate VII. their Abutments are contained within the tangent Lines of their outward Arches.

Demonstration.

In the geometrical Square *c i a m*, the Action and Re-action of the Triangles *c i m*, and *c a m* are equal, and the geometrical Square E is common to both; and as the Spandrel C is equal to the Spandrel D, and half the Scheme A to the Hanch B, therefore the Action and Re-action of the Spandrel C with the half Scheme A, and of the Spandrel D with the Hanch B are equal; and the Square E, which is contain'd within the tangent Line *c a*, remains, and is their Abutment or Super-Ballance. Becauſe its Area or Reaction with that of the Scheme B and Spandrel D, is as much ſuperior to the Preſſure or Action of the Spandrel C, and half Scheme A, as its own Area or Re-action amounts to.

So in like manner Fig. II. Plate VII. where the Arch is of much greater Thickneſs than Fig. I. the Action of the Spandrel C with the half Scheme E, is equal to the Re-action of the Hanch F, with its abutting Spandrel D; but adding the Square A to the Hanch F, and its Spandrel D, then their joint Re-action will be ſuperior to the Action of

the half Scheme E and its Spandrel C, as before in Fig I.

N. B. This last Example is given for to shew, that let the Thickness of a semi-circular Arch be great or small, as may happen, its Abutments are always similar, and contained within the Tangent Lines of its Extreams.

When the Scheme Part only of a semi-circular Arch, as *x z*, Fig. II. Plate VII. is to sustain a given Weight, and the Height of the Abutments must be but equal to the Height of the outer Arch; then the half Part of the Weight, together with the Weight of the half Scheme and its Spandrel, must be considered as a Power applied to a right-angled Wedge, as *c d e*, and the Breadth of the Abutments may be found, as before said of a straight Arch.

Prob. IV. Fig. II. Plate VII.

The Area of a semi-circular Brick Arch loaded with a given Weight, on its Scheme Part only, being given, to find the Breadth of its Abutments, whose Height is to be equal with the Vertex or Crown of the Arch, viz. 7 Ft. 3 In.

Suppose the Area of the half Scheme E to be $11\frac{1}{4}$ Feet, of the Spandrel C $3\frac{1}{2}$, and of its Weight G 15 Feet, which together make 30 Feet.

Now the right-angled Triangle *c d e* being considered as a Wedge, and the aforesaid Area of

of 30 Feet as a Power applied, the Abutments may be thus found, *viz.*

As *c d* 5 Feet
is to *d e* 5 Feet,
So is 30 the Power applied
to 30 the Equipoiſe, or Re-action of the Abutment required.

Now, as the Amount of the Abutment within *c a*, the tangent Line of the outer Arch, is but 19 Feet, *viz.* $11\frac{1}{2}$ the Hanch F; $3\frac{1}{2}$ the Spandrel D, and 4 the Square A; therefore there is a Deficiency of 11 Feet, which muſt be added to the Hanch, &c. as follows.

To find the Breadth of the additional Abutment.

RULE.

Divide (1584) the Number of ſquare Inches in (11 ſquare Feet) the Deficiency, by (87) the Number of Inches in the given Height of the Abutment, and the Quotient (18 Inches $\frac{18}{87}$) is the additional Breadth for an Equipoiſe as required: And therefore,

If the additional Breadth be made 2 Feet, then the repulſive Action of the Hanch with its aforeſaid Abutment, will be ſuperior to the Power of the half Scheme, together with its Spandrel C and Weight G; which therefore cannot remove them, and conſequently cannot fall.

When a ſemi-circular Arch, as Fig. I. Plate VIII. together with its abutting Piers, is to ſuſtain Weight to a conſiderable Height, then their Breadth, as *p o* and *o p*, muſt be made (at leaſt) each equal to *o b*, half the Extent of the whole Scheme, as before ſaid of a ſtraight Arch in Page 225 (and which is the neareſt Diſtance that a ſemi-circular, or ſtraight-headed Window or Door ought to ſtand from the Quoin of a Building.)

Demonstration.

As the Area of the Hanch C, with its Abutment A, is ſuperior to the Area of the half Scheme D, with its Spandrel B; and as the Breadth of the Pier E is equal to F, the Breadth of half the Weight; therefore the Weight F, together with the Weight of the Spandrel B, and Scheme D, is inferior to the Weight of the Pier E, together with the Spandrel A and Hanch C; which therefore can't be removed by it, and conſequently the Arch cannot fall. When a ſemi-circular Arch is not to ſuſtain Weight, as Fig. III. Plate VII. which frequently happens when Vaults are laid over with boarded Flooring, then their Abutments need be carried up but 45 Degrees above their Springing, as to *d d*, becauſe the Scheme Part C C, can by no means remove the Hanches D D, which are ſtrongly fortified by the incumbent Weight of the Walls B B.

When a ſemi-circular Arch, as Fig II. Plate VII. by Neceſſity muſt be built to the very Extreams of a Front, and ſuſtain a conſiderable Weight, then, as no abutting Piers can be had to reſiſt the Action of the Weight, there muſt be laid within the Wall, next over the Crown of the Arch, and at every 5 Feet from thence upwards, a ſubſtantial diſcharging Piece of Oak; which, over large Arches, ſhould be cogged down on Lintels, and truſſed, as a Girder of conſiderable Length is frequently done; which will not only diſcharge the Arch of the Weight, but will firmly bond the Work together.

In a Series of ſemi-circular or ſemi-elliptical Arches, as Fig. I. Plate IX. the Diameters of the internal Piers, as B B, *&c.* may be at Pleaſure; becauſe the Action and Re-action of the Abutments over them are equal: But the Breadth or Diameter of the external Pier, as A, for to ſecurely ſteady the whole, *&c.* ſhould be (at leaſt) equal to the Semi-diameter of the Arch next to it; becauſe the Re-action of that Part, together with the Addition of the Hanch B, will be very much ſuperior to the Preſſure or acting Force of the half Scheme C, ſuſtain'd by them, and therefore can't be affected by it.

The Thickneſs of Brick Arches is at Pleaſure; but I think, in common Works, they ſhould

ſhould not exceed 1 Brick and a Half, for the painted Dome of St. *Paul's* Cathedral, *London*, which is 110 Feet in Diameter, is but 2 Bricks, or 18 Inches in Thickneſs; as alſo is the Thickneſs of the Brick Fruſtum of a Cone, ſtanding over it, which ſuſtains the Stone Cupola, and Croſs, with the Iron Gallery; and therefore their Thickneſſes muſt be either a half Brick, a whole Brick, a Brick and Half, or two Bricks, as may be judged ſufficient for the Purpoſes required.

IN all Kinds of Arches, their Scheme Parts being of ſufficient Strength to ſuſtain the Weight they are to carry, cannot be made too light.

ARCHES to Drains, Common-Sewers, *&c.* need be in Thickneſs but a Half Brick, or Brick's Breadth; becauſe the Ground (being filled in equally over them) becomes their Abutment: And Arches to Vaults, under Roads, *&c.* need not exceed 9 Inches, or a Brick's Length in the Thickneſs of their Scheme Part; becauſe they are alſo fill'd up with Earth or Clay, which becomes their Abutments in the ſame Manner.

IN an Arch of a conſiderable Span, as 20, 30, *&c.* Feet, be it circular or elliptical, as Fig. III. and IV. Plate X. if its Hanches be made 1 Brick and a Half, the Scheme Part need be but 1 Brick's Length in Thickneſs; the

the Hanches being ſecured in their Abutments, as before taught, which for a further Explanation I will repeat in this.

Example. Fig. IV. Plate X.

Suppose the Area of Half the Scheme Part be $3\frac{1}{2}$ Feet, and the Area of one Hanch $5\frac{1}{2}$ Feet; and let the right-angled Triangle *a b c*, repreſent a Wedge.

Then, as *a b* (the Perpendicular) 6 Feet,
is to *a c* its Baſe, 6 Feet,
So is 3 Ft. 6 In. the Area of the Scheme,
to 3 Ft. 6 In. the Area of its Equipoiſe required in the Hanch.

But as the Area of the Hanch is equal to $5\frac{1}{2}$ Feet, therefore there is a Surplus of 2 Feet in the Area of the Abutment of the Hanch, which therefore cannot be diſplaced by the Force or Weight of the half Scheme, as being ſo much ſuperior in its Power of Reſiſtance.

In a Semi-Elliptical Brick Arch, the higher its Riſe is, the leſs is the Power of its Scheme on the Hanches.

And the Contrary,

The lower an Elliptical Brick Arch is in its Riſe, the greater is the Power of its Scheme on the Hanches.

Problem V.

The Areas of two Semi-Elliptical Brick Arches, the one on the Conjugate, the other on the

the Transverse Diameter, being given, to find their Abutments.

LET Fig II. and III. Plate IX. be the two given Arches.

I. *To find the Abutments of the Semi-Elliptical Arch,* Fig. II. *the Area of whose half Scheme is* 11-3, *and of its Hanch* 15-9.

NOW the right-angled Triangle *b g f*, being considered as a Wedge, whose Perpendicular *b g*, is $7\frac{1}{2}$ Feet, and whose Base *g f* is $4\frac{1}{2}$ Feet, it therefore follows, that,

As *b g*, 7 Ft. 6 In. the Perpendicular, is to *g f*, 4 Ft. 6 In. its Base;
So is 11 Ft. 2 In. the Area of the half Scheme, to $6\frac{2}{3}$ Feet, the Equipoise.

NOW, as the Area of the Hanch is 15 Ft. 9 In. and the Amount of the Equipoise of the Scheme is but 6 Ft. 8 In. therefore the Hanch, within its self only, contains a Super-Ballance of 9 Ft. 1 In. which is nearly equal to 9 Ft. 9 In. the Area of the Spandrel on the half Scheme.

IF the Area of the Spandrel on the half Scheme be added to the Area of the half Scheme, whose Sums are equal to 20 Ft. 9 In. then their abutting Equipoise must be $12\frac{2}{5}$ of a Foot. For,

As

2

As $7\frac{1}{2}$ Feet, the Perpendicular *b g*,
is to $4\frac{1}{2}$ Feet, the Base *g f*;
So is $20\frac{1}{4}$ Feet, the Areas of the Scheme and its Spandrel, to $12\frac{2}{5}$; which is upwards of $3\frac{1}{3}$ Feet less in Power, than is contain'd in the Hanch only: So that this Surplus above the Equipoise, will not admit the Hanch to be removed by the Pressure of the half Scheme and its Spandrel.

If to the Hanch be added the abutting Spandrel *z*, and the Parallelogram *x*, whose Areas are $19\frac{1}{2}$ Feet, and with the Area of the Hanch, are equal to $35\frac{1}{3}$ Feet, the Power of their joint Re-action against the half Scheme, and its Spandrel, will be $58\frac{8}{9}$.
For as $4\frac{1}{2}$ Feet, the Base *g f*,
is to $7\frac{1}{2}$ Feet, the Perpendicular *b g*:
So is $35\frac{1}{3}$ Feet, the Area of the Hanch, *&c.* to $58\frac{8}{9}$ Feet, its Equipoise; which is a Surplus of upwards of 48 Feet.

SURELY had PALLADIO known how to calculate the acting and re-acting Powers of the Scheme and Hanch Parts of an Elliptical Arch, on its conjugate or short Diameter, he would not have said that a Semi-circular Arch is of all others the strongest; because herein 'tis manifestly proved to be otherwise.

II. *To find the Abutments of the Semi-Elliptical Arch*, Fig. III. Plate IX. *the Area of whose*

whose half Scheme x *is* $31\frac{1}{2}$ *Feet,* and of its *Hanch* z, 24 *Feet.*

THE right-angled Triangle *a b c*, being consider'd as a Wedge, whose Perpendicular *a b* is 10 Feet, and whose Base *b c* is $17\frac{1}{2}$ Feet, and the Area of the half Scheme, with its Spandrel, being $41\frac{1}{2}$, the Abutment is thus found, *viz.*

As 10, the Perpendicular *a b*,
is to $73\frac{1}{2}$ Feet, the Base *b c*;
So is $41\frac{1}{2}$ Feet, the Area of the half Scheme, with its Spandrel, to $71\frac{1}{20}$ the Equipoise.

NOW as the Area of the Hanch *z*, together with its abutting Spandrel *p*, and Parallelogram *n*, is but 54, therefore there is a Deficiency in the Equipoise of Abutment, of $17\frac{1}{2}$ Feet, which must be annexed.

RULE.

NOW, as before, in Page 229, if the Deficiency $17\frac{1}{2}$ Feet, be divided by the Height of the Crown of the Arch, *viz.* 11 Feet, the Quotient $1\frac{11}{22}$ Foot, is the Breadth of Abutment to be annexed, for to make good the Ballance of Re-action in the Abutment. But as the Re-action of the Hanch of an Arch, with its abutting Spandrel, &c. should always be superior to the pressing Power of the half Scheme Part, therefore if the Breadth of the annexed Abutment be made 2 Feet instead of $1\frac{11}{22}$ Feet, the Arch never can fall.

In

IN all Kinds of Arches whose Abutments exceed their Limits, as that of Fig. III. Pl. IX. the thinner or lighter the Scheme Part is made, the less the annexed Abutment will be. As for Example;

IN Plate X. the Arch Fig. I. is the same Extent and Height as Fig. III. Plate IX. but the Thickness of the Arch being equal but to Half the other, therefore the Breadth of the annexed Abutment required is but $8\frac{2}{11}$ Inches, which is upwards of 10 Inches less than the annexed Abutment of the other.

For as *a b*, $8\frac{1}{2}$ Feet,
is to *b c*, $17\frac{1}{2}$ Feet;
So is $19\frac{1}{2}$ Feet, the Area of the half Scheme, and its Spandrel,
To $40\frac{2}{17}$ Feet, the Equipoise.

NOW as the Area of the Hanch *f*, with the Areas of its abutting Spandrel *g*, and Parallelogram *h*, are equal to $32\frac{1}{2}$ Feet, therefore the Deficiency in the Equipoise is about $7\frac{1}{2}$ Feet; which being equal to 1080 square Inches, and being divided by 132, the Number of Inches in 11 Feet the given Height, the Quotient $8\frac{2}{11}$ Inches is the Breadth of the annexed Abutment; which to make (with the Hanch, &c.) superior in Re-action, I allow at 9 Inches.

WHEN

When an Elliptical Arch, as Fig. II. Plate X. is to ſuſtain Weight on its Scheme Part, as before ſaid of the ſemi-circular Arch, Fig. I. Plate VIII. then the Breadths of the abutting Piers, as *a b* and *d e*, muſt be made each equal to *b c*, Half the Breadth of the Scheme, for the ſame Reaſon.

Rampant ſemi-circular Arches being ſometimes required, I ſhall therefore ſhew their Conſtruction and Abutments.

Prob. VI.

To deſcribe a Rampant Semi-circular Arch, and to find its Equipoiſe of Abutments, Fig. I. Plate XI.

Operation.

Bisect the given Diameter *x y* in B, and on B erect the Perpendicular B C —Make *x t* equal to the given Height of the Ramp, and draw the Ramping Diameter *t* A *y*.—On the Point A erect the Line A *i*, perpendicular to *t y*, and equal to the Semi-diameter *B y*.—Draw the Lines *t i* and *i y*, and biſect them in the Points *v* and *w*.—From the Point *w*, draw the Line *w l*, perpendicular to *i y*, cutting the Diameter *x y* in the Point *l*.—From the Point *v* draw the Line *v h*, perpendicular to the Line *t i*, until it meet the Line *i l*, in *h*. Then *h* is the Center of the Rampant Arch *t* D *i*, and *l* is the Centre of the Arch *i* E *y*.

The Breadth of the Arch *y z*, is at Pleaſure.

Now

Now for the Abutments.

As the Sides of this Kind of Arch are unequal in their Curvatures, so their Abutments are also unequal. But the Method or Rule by which they are found, is the same as the preceding. For if the Triangle *n l* A be considered as a right-angled Wedge, then

As the Perpendicular *n l*, 3 Feet,
is to the Base *l* A, 5 Feet,
So is 4 Feet, the Area of the Rampant half Scheme *b*, and its Spandrel *e*, to $6\frac{2}{3}$, the Equipoise.

Now, the Areas of the Parallelogram *c*, of the abutting Spandrel *d*, and of the Rampant Hanch *a*, being together equal to $7\frac{1}{2}$ Feet, which is 10 Inches more than $6\frac{1}{2}$ Feet, the above Equipoise; therefore the Re-action of the Hanch *a* with *c* and *d*, is so much superior to the Pressure or Action of the rampant Scheme *b*.

Again, If the Triangle *g k* A be considered as a Wedge, as before:

Then as the Perpendicular *g k*, 4 Feet,
is to the Base *g* A, 2 Feet 9 Inches;
So is 7 Feet, the Area of the half Scheme F, with its Spandrel *p*, to 4 Feet 9 Inches, the Equipoise.

Now, as the Area of the Hanch S, with the abutting Spandrel *r*, and Parallelogram *q* together, are equal to 7 Feet; which is 2 Feet and 3 Inches more than $4\frac{3}{4}$ Feet the Equipoise, therefore the Re-action of the Hanch S, *&c.* is so much superior to the Pressure or Action of the half Scheme, *&c.*

Hence 'tis evident, that the Abutments of a rampant semi-circular Arch, are contain'd within the Perpendiculars of the Extreams or Limits of its Diameter.

Gothick Arches, which rise higher than half their Extent, called Oxe-Ey'd Arches, as Fig. II. and III. Plate XI. have also their Abutments within the Limits of the Extreams of their Extents: But those Arches which rise less than half their Extent, as Fig. I. and II. Plate XII. demand Abutments which will extend beyond the Limits of their Extent, in the same manner as an elliptical Arch on the long Diameter.

Demonstration. Fig. II. Plate XI.

Let a b c *be considered as a right-angled Wedge.*

Then as *a b*, the Perpendicular 4 Feet, is to *b c* the Base, 4 Feet;

So is 8 Feet 6 Inches the Area of the half Scheme *x*, and its Spandrel *e*, to $8\frac{1}{2}$ Feet the Equipoise.

Now

Now as the Area of the Hanch *f*, together with the Area of its abutting Spandrel *g*, and Parallelogram *d*, is $22\frac{1}{4}$ Feet more than $8\frac{1}{2}$ the aforesaid Equipoise; therefore the resisting Power of the Hanch *f*, with the abutting Spandrel *g*, and Parallelogram *d*, is so much superior to the Pressure or acting Power of the half Scheme *x*, and its Spandrel *e*.

When an Arch of this Kind, whose Radius's are equal to 3 Fourths of the Breadth in the Clear, is to sustain Weight, the Breadth *w z* of the Abutment from *w* the Perpendicular of the Hanch, must be made equal to *v w*: For as the Spandrel *e* is much less than the Spandrel *g*, and the Parallelogram *d*; therefore *v w* and *w z* being equally loaded, the Weight laid on *v w* cannot affect the Weight laid on *w z*.

Again, Fig. III. Plate XI.

Let b c d *represent a right-angled Wedge, as before.*

Then as *b c* the Perpendicular, 3 Feet,
is to *c d* the Base 3 Feet;
So is $6\frac{1}{4}$ Feet, the Area of the half Scheme *a*, and its Spandrel *x*, to $6\frac{1}{4}$ Feet, the Equipoise.

But as the Area of the Hanch *e*, together with the Area of its abutting Spandrel *f*, and Parallelogram *n*, is equal to 28 Feet, which is $21\frac{3}{4}$ Feet more than $6\frac{1}{4}$, the aforesaid Equipoise; therefore the half Scheme *a*, with its

Spandrel *x*, cannot affect the Hanch *e*, *&c.* whose Superiority of Resistance is so much greater.

IT is from this great Superiority of Resistance in the Hanches and their Abutments, that the Strength of this Arch (whose Curves are described on the extream Points of its Opening in the Clear) much exceeds that of a Semi-cirle; for this Arch may be loaded with any Weight, without enlarging its Abutments beyond the Perpendiculars of its Limits (which cannot be done so with a semi-circular Arch.) Because the Weight *h i* and *l m*, over the Hanches, are of greater Breadth than *i k* and *k l* over the Scheme contained between them, and therefore have a Superiority of Resistance; whereas in a Semicircular Arch, as Fig. II. Plate VIII. the Breadth *b c d* over the Scheme, is greatly Superior to *a b* and *d e*, the Breadth over the Hanches, and therefore when such an Arch is to sustain Weight, its Abutments will extend beyond the Perpendiculars of its Limits, as Fig. I. Plate VIII. which the Gothick Arch, Fig. III. Plate XI. will not.

GOTHICK ARCHES which rise less than half their Extent in the Clear, as Fig. I. and II. Plate XII. demand Abutments which will extend beyond the Perpendiculars of their Limits, as aforesaid.

DEMON-

DEMONSTRATION. Fig. I. Plate XII.

Let o w l *represent a right-angled Wedge, as before.*

Then as *o w* the Perpendicular, 5 Ft. 4 In. is to *w l* the Base, 10 Ft. 8 In.

So is the Area of *b*, with its Spandrel *d* (*viz.* 11 Feet) to 22 Feet the Equipoise.

NOW as the Area of the Hanch *a*, together with its abutting Spandrel *e*, and Parallelogram *c*, is equal but to 7 Feet 9 Inches, which is $14\frac{1}{4}$ Feet less than 22 the Equipoise; therefore the Equipoise of its Abutment will extend beyond A B the perpendicular Limit of the Arch, 2 Feet 11 Inches and $\frac{13}{15}$ of an Inch: For 2152, the Number of square Inches contained in $14\frac{1}{4}$ superficial Feet, the aforesaid Deficiency of Abutment, being divided by 60 Inches, A B, the Streight of the Arch, the Quotient $35\frac{13}{15}$ is the Extent in Inches of the Abutment from C to D, the Extream of the Arch; and therefore, if from C to D be set 36 Inches or 3 Feet, for the Extent of the Abutment, then its Power of Resistance will be $\frac{2}{15}$ of an Inch superior to the Pressure or acting Power of the half Scheme E and its Spandrel F, which therefore cannot fall.

AND so in like manner, Fig. II. Plate XII. if *a b c* be considered as a right-angled Wedge, then,

As the Perpendicular *a b*, $12\frac{1}{2}$ Feet,
is to the Base *b c*, 17 Feet;
So is $51\frac{1}{2}$ Feet, to $70\frac{1}{25}$ Feet.

NOW, as the Area of the Hanch *q*, together with the Area of its Spandrel, and of its Parallelogram *d*, is equal but to 28 Feet and 2 Inches, which is 41 Feet 10 Inches (nearly) less than $70\frac{1}{25}$ the Equipoise; therefore the Abutment will extend $3\frac{9}{11}$ Feet, as from *n* to *m*.

For 41 Feet 10 Inches, the Deficiency of Abutment, being divided by 11 Feet, the Height of the Crown of the Arch, the Quotient is nearly $3\frac{9}{11}$.

WHEN these kind of Arches are to sustain Weight, then their Abutments must be enlarged, as those are to the Semi-ellipsis. Fig. II, Plate X.

FROM what has been now delivered 'tis plain, that all Arches which rise half (or more) of their Extent in the Clear, contain their Abutments within the Perpendiculars of the Limits of their Extreams, and the horizontal Lines of their Crowns, as the semi-circular Arch Fig. I. Plate VII. the semi-elliptical Arch Fig. II. Plate IX. and the Gothick Arches, Fig. II. and III. Plate XI.

And therefore,

IF in a Series of either of those kinds of Arches, as of a Piazza, Bridge, &c. as in Plate

Plate XIII. the Breadth of the Piers or Legs in Front, be made equal (at leaſt) to twice the Thickneſs of the Arch, then every Arch will be independent; and if any one ſhould fail, it will not affect the Arch, or Arches next to it; and therefore may be taken down and rebuilt at Pleaſure.

In a Series of Elliptical or Gothick Arches, as Fig. I. and II. Plate XIV. whoſe Height is leſs than Half their Extent in the Clear, the Breadth of their Piers, or Legs in Front, muſt be (at leaſt) equal to the two Abutments of each Arch, becauſe then each Arch will be independent, and may, on Failure, *&c.* be taken down and rebuilt at Pleaſure, without affecting the Arch or Arches next to it, as aforeſaid, which cannot be done when the Breadth of the Piers are of leſs Dimenſions.

And when an elliptical arched Vault is to be built between two ſemi-circular Vaults, of leſs Extent, as Fig. III. Plate XIV. the Breadth of the inward Piers, which carry the elliptical Vault, muſt be (at leaſt) equal to the Abutment of the Ellipſis, and the Thickneſs of the ſemi-circular Arch alſo; for if the Breadth is leſs, the Force of the elliptical Arch will affect the ſemi-circular Arches on both Sides; and if the Force be any thing conſiderable, at the ſtriking of the Centres, it will force up the ſemi-circular Vaults at their Crowns, and all together fall down in Ruin, as happen'd (if

my Information be true) at *Spitalfields* new Church *, whose Vaults were at the first so built, and fell down at the striking of the Centres; and which had also been the Case of *Bishops-Gate* † when last rebuilt, had it not been shored up for some Time, whilst its Scheme Part was made less massy, and its Abutments more weighty.

HAVING thus explain'd the Abutments of Arches, in so plain a Manner, as to be understood by any Person who is Master of so much Vulgar Arithmetick, as to work the Rule of Three Direct, I hope it may be a Means of preventing the Loss of Lives for the future: For, for the want of a just Knowledge herein, many Lives have been lost by the falling of Arches on Workmen, at the striking of their Centres, when they have not been secured with sufficient Abutments.

SECT. XII. *Of* BRICK FLOORS *and* ARCHED CEILINGS.

FOR to securely prevent the sad Consequences of Fire in Dwelling-Houses, and especially in *London*, the making of Brick Floors, with arched, groined, or coved Ceilings, would be effectual, and especially if the Insides of Rooms were to be finished with Ornaments

* Built by Mr. *Hawksmore*.
† Built by Mr. *James*, late of *Greenwich*.

naments of Stucco (ſave the Skirtings next the Floors, and the Surbaſes, to keep off Chairs from the Walls) the Floors to be laid with coloured poliſhed Plaiſter, as thoſe are in the Houſes of their Graces the Moſt Noble Dukes of *Richmond* and *Montague* in *Privy-Garden*, *Whitehall*, and many others in and about the City of *London*, and the Stair-Caſes of Stone.

I ſay, if Buildings were to be thus erected and finiſhed, no Fire, unleſs that from Heaven (which may vitrify even the moſt compact Flint in an Inſtant) can affect them in any Part, their Roofs excepted, when made of Timber; and even then, it cannot affect the lower Parts: But if the Covering be of Lead, bedded on the Arch of the upper Appartments, nothing of accidental Fire can ever affect them.

INDEED ſome may object hereto and alledge, That ſtucco'd Walls have a cold Look, and too much of the *Sameneſs*. But to this I anſwer, That tho' the Hall, *&c.* is ornamented on its Sides and Ceiling with Stucco, yet other Rooms being rendered on the Walls (no Partitions being of Timber) may be hung with Paper paſted on the Rendering, in as various a Manner as the moſt curious Eye can deſire, which Fire will not eaſily affect; and in caſe by Accident it ſhould, it can go no farther than to the Ceiling, nor can the Suffocation of its Fire be any thing comparable to that of Wainſcoting.

IN

IN Plates XV, XVI, XVII. I have given four Varieties of arched Ceilings and Brick Floors; those of Plate XV. are semi-circular; those of Plate XVI. are semi-elliptical; and those of Plate XVII. the upper one is Gothick and the lower one is flat, sustained by a Cove whose Height is one 5th of the entire Height of the whole Room.

IN all Apartments whatever, the Weight of the Walls, rising from their Floors, is always much superior to the pressing Force of their Floors, which therefore cannot fall.

THE Thickness of Brick Floors to Rooms not exceeding 30 Feet in Breadth (being truely worked) need not exceed a Brick's Length in the Thickness at the Crowns of their Arches.

THE Bricks with which arched Ceilings are turned, should be perfectly sound, and the most compact that can be had, as the best of Red-stock Bricks, *&c.* But their Spandrels and Floors above may be made good with *Place Bricks, &c.* Because they sustain nothing more than their own Weight and the Plaister Floors laid on them. Nor is there any Necessity to make the Scheme Part of arched Ceilings to the upper Apartments, of greater Thickness than a Brick's Breadth; because they carry nothing more than their own Weight, unless when Buildings are covered flat with Lead, and

and then indeed the Thickneſs of their Crowns over large Rooms, ſhould be a Brick's Length.

To ſecure the Ceilings of the upper Apartments from falling, their reſpective Abutments muſt be firſt found, and then raiſing the Walls ſo far above them, as that their Weight above the ſpringing of the Arch ſhall be ſuperior to their Abutments required; then there will be no Poſſibility for the Ceilings ever to fall, becauſe the reſiſtive Power of the Walls will be ſuperior to the Preſſure or acting Force of the Ceilings againſt them.

In the ſetting of arched Ceilings (the Bricks being firſt rubbed and gaged truly) 'tis beſt to ſet them dry rather than to uſe Putty Mortar, or if any be uſed, to be as little as poſſible; for the leſs Mortar is uſed, the leſs Settlement will be.

In the working of a flat Ceiling ſuſtained by a Cove, as Fig. II. Plate XVII. It will be beſt to work it a little cumber, to allow for the Settlement of the Courſes, which will always be ſomething, tho' they are rubbed and ſet with all the Care and Exactneſs that can poſſibly be taken and done.

Now with regard to the Expence. When 'tis determined to build an Edifice in this Manner, there may be a great deal of Labour ſaved by making a Mould agreeable to the Arch to be

be raiſed, for the Brick-maker to make the Ceiling Bricks in, whereby the Labour of cutting or ſawing off the Waſte, to bring them into their Wedge Form, will be ſaved, and they will need nothing more than a little rubbing, unleſs in groin'd Ceilings, whoſe Angles muſt be cut.

EVERY Cube Foot, allowing for Waſte, will imploy 16 Bricks, and therefore every Rod of Work, *viz.* every 306 Cube Feet, will imploy 4896 Bricks, which for Eaſe in Computation, I allow at 4900, and which, at 30 *s.* *per* Thouſand, comes to 7 *l.* 7 *s.* prime Coſt, which is nearly 6 *d.* *per* Cube Foot. And as the Mortar for this kind of Work muſt be well beat, I therefore allow it at 25 *s.* 6 *d.* *per* Rod, which is 1 *d.* *per* Cube Foot; and the Workmanſhip at 2 *l.* 5 *s.* *per* Rod, which is $\frac{73}{51}$ Farthings *per* Cube Foot: So that allowing the Bricklayer $12\frac{1}{2}$ *per Cent.* *per* Rod Profit on the Bricks, the Expence *per* Rod is as follows, *viz.*

For Bricks	7	7	0
Profit thereon	0	18	$4\frac{1}{2}$
Mortar	1	5	6
Labour	2	5	0
Total	9	10	$10\frac{1}{4}$

Which is nearly $7\frac{1}{2}$ Pence *per* Cube Foot.

IN

In the arched Ceiling and Floor, over Fig. II. Plate XV. which is 15 Feet in Diameter, every Foot in Length on the Floor contains 42 Cube Feet of Brick-work in the Arch, and Spandrels over it.

Now 42, the aforesaid Number of Cube Feet, being multiplied by $7\frac{1}{2}$ Pence, the above Price *per* Cube Foot, the Product 315 Pence, divided by 15 the Number of square Feet on the Floor, at 1 Foot in Length, the Quotient 21 Pence, equal to 1 *s.* 9 *d.* is the Price *per* square Foot on the Floor, which is 8 *l.* 15 *s.* *per* Square, which I allow at 8 *l.* 8 *s.* exclusive of the Plaister Floor to be laid on them, which is worth about 3 *l. per* Square more, and exclusive of the Expence of Centering to turn the Arches on, which is explained in the Prices of Carpenters Works, to which I refer.

To measure the Solidity of a continued arched Brick Ceiling and Floor.

This is the RULE. Fig. II. Pl. XV.

From the Area of the Parallelogram, contained between the Surface of the Floor and the Springing of the Arch (as *a b h i*) subtract the Area of the Vacuity of the Arch (be it semi-circular, semi-elliptical, &c.) as the Area of

of the Semi-circle *h k i*; and the Remains will be the Area of the Face or Section of the Arch and its Spandrels, which being multiplied into the Length, the Product will be the Solidity of the Arch and Spandrels together, as required.

AGAIN,

IF from the Area of the Section of the Arch and Spandrels, be subtracted the Area of the Section of the Arch's Thickness only, the Remains will be the Area's of the two Spandrels.

NOW if these separate Area's in square Feet, be multiplied by the Length of the Floor, and their Products by 16, the Number of Bricks required to 1 Cube Foot, the last Products will shew the Number of Stock Bricks required for the Arch, and the Number of Place Bricks for the Spandrels; from the Knowledge of which their Expence may be computed with Certainty.

AND that the Mensuration of the Faces of semi-circular, &c. Arches, and of their Spandrels, may be truly understood, I will give another Example by way of Problem, which will make such Admeasurements easy to the meanest Capacity, that is concern'd in the Business of Measuring.

PROBLEM.

The Area of a Parallelogram, as a p c q, Fig. II. Plate VII. *being given, to find the Area of its inscribed Semi-circle* c b q, *and of*

of its Spandrels a b c *and* b p q, *and their respective Proportions to each other:*

Suppose the Length of the Parallelogram *c q*, to be 50 Feet, and its Breadth 25 Feet, and Area 12500.

Now as the Area of every Geometrical Square is to the Area of its inscribed Circle, as 14 is to 11; therefore the Area of every Parallelogram is to the Area of its inscribed Semicircle as 7 is to $5\frac{1}{2}$: And therefore,

As 7 is to $5\frac{1}{2}$, so is 1250 Feet the Area of the given Parallelogram, to $982\frac{1}{7}$ Feet, the Area of the Semi-circle *c b q*; which being subtracted from 1250, the Remains $267\frac{6}{7}$ Feet, is the Area of the two Spandrels *a b c* and *b p q*, whose half, *viz.* $133\frac{13}{14}$ Feet is the Area of each.

Or otherwise,

Consider the Semi-circle *c b q*, as two Quadrants, as *b c e*, and *b e q*, inscribed within the Squares *a b c e* and *b p e q*, whose Areas are each 625 Feet.

Then this is the RULE, *viz.*

Divide (625) the Area of one of the Squares by 14; then 11 Times $(44\frac{9}{14})$ the Quotient (*viz.* $491\frac{1}{14}$) is the Area of its inscribed Quadrant, and 3 Times $(44\frac{9}{14})$ the Quotient, *viz.* $133\frac{13}{14}$ is the Area of its Spandrel, as before.

For

For as the Area of a Square is to the Area of its inſcribed Circle as 14 is to 11, ſo the Area of a Square is to the Area of its inſcribed Quadrant as 14 is to 11 alſo; and therefore the Area of a Semi-circle ſo inſcribed, is to the Areas of its Spandrels, as $5\frac{1}{2}$ is to $1\frac{1}{2}$; and as the Area of a Square (as *a b c e*) is to the Area of its inſcribed Quadrant (as *b c e*) as 14 is to 11; therefore the Area of the Quadrant *b c e* is to the Area of the Spandrel *a b c*, as 11 is to 3.

And therefore,

As 11 is to 3, ſo is the Area of a Quadrant to the Area of its Spandrel.

And contrary,

As 3 is to 11, ſo is the Area of a Spandrel to the Area of its Quadrant.

Thus much for this Digreſſion, which is both entertaining and uſeful. Now to return.

When a ſemicircular arched Ceiling is interſected by one or more ſemi-circular Arches of the ſame Height, at right Angles, called Groin'd Arches, the Superficies of ſuch a Ceiling, ſo groin'd, is exactly the ſame as if the Curve of the Ceiling was a continued Arch without ſuch Groins.

Let *i k b x*, Fig. I. Plate XVIII. be the Plan of a ſemi-circular Arch, of 20 Feet in Diameter

Diameter and 20 Feet in Length—alſo, let *a b c d* be the Plan of a ſemi-circular groin'd Ceiling of the aforeſaid Dimenſions.

Now I ſay,

If *m o* the Length of the Parallelogram, Fig. II. be made equal to $63\frac{1}{7}$ Feet, the Circumference of the given ſemi-circular Arch; and its Breadth *p m*, to 20 Feet, the given Length of the Arch; its Area will be equal to the Area of the given continued Arch: And therefore the two Diagonals *m r* and *p o*, being drawn, the Areas of the two Triangles *m s o* and *p s r* will be equal to the Area's of the two groin'd Triangles which ſtand over the two Triangles A and B in the Plan: And ſince that the two Triangles C and D in the Plan are equal to the Triangles A and B, therefore the groin'd Triangles that ſtands over them, as the Triangles E and F, muſt be equal in their Dimentions to the two Triangles *m s o* and *p s r*.

Now as the Triangle *m o s* and *p s r* are Parts of the continued Arch, it therefore only remains to prove, that the Triangles E and F, which are equal to the Triangles *m o s* and *p s o*, when bent to their Curves, and ſet in their Places; are alſo equal to the two Triangles *m s p* and *s o r*, the remaining Parts of the continued Arch.

DEMONSTRATION.

DRAW the two Diameters *n q* and *v t*, which will divide the whole into four leſſer Parallelograms, as *m n v s*, *n o s t*, *v s p q*, and *s t q r*, which are all of equal Dimenſions, and which are each divided into two equal Triangles.

NOW as the Triangles B and C are equal, and as the Triangle D is equal to the Triangle C, and likewiſe to the Triangle E, therefore the Triangles D and E, are equal to the Triangles B and C, and the Triangle *s o r*, is equal to the Triangle *m o s* or *p s r*, which are alſo equal to the two Triangles E and F, *which was to be proved.*

N. B. The Area's of the Triangles *m s p* and *o s r*, may be proved to be equal to the Triangles *m o s* and *s p r*, arithmetically, as follows, *viz.*

MULTIPLY the Baſe of the Triangle *p r*, $63\frac{1}{7}$ Feet, the Circumference of the Arch, by 10 Feet, Half the given Length, and the Product $637\frac{1}{7}$ is the Area of the two Triangles *m o s* and *s p r*.

Again,

MULTIPLY the Baſe of the Triangle *m s p*, 20 Feet the Length, by $31\frac{6}{7}$ the Half of the Curve, and the Product is $637\frac{1}{7}$ as before; wherefore the Triangles *m s p* and *o s r*, are equal

equal in Area's to the Triangles *m o s* and *s p r*.

Now ſince that the Superficies of continued ſemi-circular Ceilings, and ſemi-circular groin'd Ceilings of equal Dimentions are equal, it therefore follows, that the Dimenſions of a groin'd Ceiling is to be taken, as if 'twas a continued Arch throughout the whole Length: But as the working of Groins, in cutting and ſetting, require a great deal more Time than a ſtraight continued Arch, the Price of Workmanſhip (only, not of Materials) muſt be rated at the double Price of common Work, *viz.* 3 *l. per* Rod, which is nearly $2\frac{1}{2}$ Pence *per* Cube Foot: And the Expence *per* Rod, excluſive of the Plaiſter, Flooring, and Centering is as follows, *viz.*

4900 Bricks at 30 *s.*	7	7	0
Maſter's Profit thereon	0	18	6
Mortar	1	5	6
Labour { Excluſive of cutting the Angles }	3	0	0
Sum.	12	11	0

Which for Eaſe in Computation, I allow at 12 *l.* 12 *s.* which is almoſt 10 *d. per* Cube Foot.

Now, as before,

As 42 Cube Feet, produced but 15 ſuperficial Feet of Flooring, therefore 1 Rod, *viz.*

306 Cube Feet, will produce but $109\frac{1}{2}$, which for Ease in Computation, I allow at 110 Feet.

Now, if 12096, the Number of Farthings in *Twelve Guineas*, the Price *per* Rod as aforesaid, be divided by 110, the Quotient, which is nearly 110, is the Number of Farthings *per* Foot superficial on the Floor, *viz.* 2*s.* $3\frac{1}{2}$*d.* which is 11*l.* 9*s.* 2*d.* *per* Square; and which, for Ease in Computation, I allow at 11*l.* 11*s.*

N. B. The common Price for cutting Groins in and about *London*, is 6 *d.* *per* Foot lineal Measure.

SECT. XIII. *Of* HEMISPHERICAL, HEMISPHEROIDICAL, CONICAL, *and* PYRAMIDICAL *Brick Works.*

HEMISPHERICAL and Hemispheroidical Brickworks, are vulgarly called *Domes*, as those of St. *Paul*'s Cathedral, where the inside painted Dome is a Hemisphere, and the outward Dome covered with Lead, is a Hemispheroid.

A HEMISPHERE is a Concave generated by the Revolution of a Quadrant about one of its Sides, as an Axis; as likewise is a Hemispheroid,

pheroid, by the Revolution of a 4th Part of an Ellipsis, about the longest Side.

As I have already proved, that a Semicircular Arch or Vault, which hath no Spandrels on it or against it, and therefore sustains no Weight save that of its own, cannot fall, the Action of the Scheme Part, and the Re-action of the Hanches being equal; so here in the hemispherical Dome 'tis the same, for the same Reason.

But as a Superiority of Resistance in the hanch'd Part of a Dome is necessary, it is therefore best for to make the Crown Part of lesser Thickness than the Hanch Part, as is represented in Fig. IV. Plate X. or Abutments may be worked up above the Springing of the Dome, as *a a*, Fig. III. Plate XVIII.

All spherical Domes, be they of little or large Dimensions, may be built with Brick or Stone, without a Centre to turn them on, as has been usually practised: For as the Distance from the Centre to the concave Superficies of a hemispherical Dome is in all Places the same, and as every Course of Bricks, worked with a true Sommering to the Centre, doth thereby become an inverted Frustum of a Cone, and consequently does firmly wedge themselves together, therefore they cannot descend, so as to have any bearing on a Centre, was one to be placed under them for that Purpose.

N. B. *A straight Piece of Deal, as a Pantile Lath,* &c. *made in Length equal to the Semidiameter of the Concavity of the spherical Dome, having one End always fixed to the Center, the other End will not only shew the just Distance of every Course of Bricks, all the Way up to the Vertex or Crown of the Dome, but will also give the true Sommering of every Course. This Instrument I call a Director.*

The Materials, *viz.* Bricks and Mortar, for this kind of Brickwork, are the same *per* Rod, both in Quantity and Price, as in common Walling of Grey-Stock Bricks; but the Price of Workmanship, exclusive of Scaffolding, if the Work be lofty, is worth double Price, *viz.* 3 *l. per* Rod.

The Superficies (either convex or concave) of a Hemisphere, may be measured by either of the following Rules, viz.

RULE I.

Find the Area of a Circle which is equal to its Base, then, double that Area and the Sum is the Area of the Hemisphere. *Because the Superficies of a Sphere is equal to the Area's of 4 great Circles of the same Sphere.*

Example.

Suppose the Diameter of a spherical Dome, from Out to Out, be 20 Feet, then $3\,14\frac{2}{7}$ the

the Area of the Circle over which it ſtands, being doubled, the Sum is $628\frac{4}{7}$ Feet, which is the Area of the convex Superficies of the Hemiſphere, as required.

RULE II.

MULTIPLY the Diameter of the Hemiſphere from Out to Out, by half the extream Circumference of its Baſe, and the Product is the Area required.

So 20 Feet, the above Diameter, being multiplied by $317\frac{3}{7}$, the half Circumference of the Baſe, the Product is $628\frac{4}{7}$ Inches, as before.

RULE III.

SQUARE the Diameter, multiply the Product by 11, and the laſt Product being divided by 7, the Quotient is the Area required.

So the Diameter 20 ſquared, the Product is 400, which multiplied by 11, the Product is 4400, and which being divided by 7, the Quotient is $628\frac{4}{7}$, as before.

N. B. THESE Rules for finding the convex Superficies of a Hemiſphere, will alſo find the concave Superficies; the Diameter being taken in the Clear, from Inſide to Inſide, inſtead of from Out to Out.

THE next Work in Order, is to ſhew, *How to meaſure the Solidity of a Brick Hemiſphere.*

BUT before I lay down Rules for its Admeaſurement, I muſt firſt ſhew,

How to meaſure the Solidity of a Sphere, as follows, viz.

THE Solidity of every Sphere is equal to two Thirds of its circumſcribing Cylinder.

THEREFORE the Area of a great Circle of a Sphere, being multiplied by two Thirds of its Diameter, the Product is the Solidity of the Sphere.

As for Example.

SUPPOSE the Diameter of a Sphere to be 20 Feet. Then I ſay,

If 314^{2} Feet, the Area of its great Circle, be multiplied by $13\frac{1}{3}$ Feet, equal to two Thirds of its Diameter, the Product $4190\frac{10}{21}$, is its Solidity.

The Solidity of a Sphere may be alſo found, by either of the following Rules, *viz.*

RULE I.

CUBE the Diameter, multiply the Product by 11, and divide the laſt Product by 21. Then the Quotient is the Solidity required.

SUPPOSE the Diameter of a Sphere be 20 Feet.

Then

Then 8000, the Cube of the Diameter, multiplied by 11, and the Product 88000 divided by 21, the Quotient $4190\frac{10}{21}$ is the Solidity required.

RULE II.

As 1 is to the decimal Fraction ,5238, ſo is the Cube of the Diameter to a fourth Number, from which cutting off four Places of Figures to the Right-hand, the Remains to the Left are Integers, and the four Figures cut off are decimal Parts, which together is the Solidity required.

So the decimal Fraction 5238 multiplied by 8000, the Cube of the Diameter, the Product is 4190,4000, from which cutting off four Places of Figures to the Right-hand, *viz.* 4000, the Remains to the Left, *viz.* 4190 are Feet, and the Remains 4000 is $\frac{4}{10}$, whoſe Difference from $4190\frac{10}{21}$ the Solidity found in Rule I. is very inconſiderable.

Now, to find the Solidity of a Brick Dome, this is the Rule, *viz.*

RULE.

Conceive the aireal Space, within a ſpherical Dome, as one half Part of a Sphere; alſo conceive the Dome itſelf, together with its aireal half Sphere, as an entire half Sphere.

Then

Then ſubtracting the Solidity of the aireal half Sphere, from the Solidity of the entire half Sphere, the Remains or Difference will be the Solidity of the Shell or Dome.

EXAMPLE.

SUPPOSE the Diameter of a Brick ſpherical Dome from Out to Out be 20 Feet, and the Thickneſs of the Shell or Dome be 2 Bricks Length, *viz.* $1\frac{1}{2}$ Feet, which reduces the Diameter of the aireal half Sphere to 17 Feet.

Then I ſay,

IF from $2095\frac{5}{21}$, the half Solidity of a Sphere, whoſe Diameter is 20 Feet, be ſubtracted $133\frac{15}{42}$ Feet, Half the Solidity of a Sphere, whoſe Diameter is 17 Feet, the Remains or Difference $761\frac{37}{42}$ is the Solidity of the Shell or Dome.

THUS much with reſpect to entire hemiſpherical Domes. Now I ſhall explain the Menſuration of their Segments.

BUT before the Segment of a Dome can be meaſured, the Admeaſurment of the Segment of a Sphere muſt be underſtood. ——

THE Solidity of any Segment of a Sphere may be found very nearly true by theſe Rules.

RULE I.

To three Times the Square of the Semi-diameter of its Base, add the Sum of the Square of its perpendicular Height, then that Sum being multiplied by the Height, and the Product by the decimal Fraction ,5236, the last Product so produced, cutting off four Places of Figures to the Right, as a decimal Fraction, is the Solidity required.

So if the Diameter of a Segment of a Sphere be 16 Feet, and its Perpendicular Height 4 Feet,

Then I say,

If to 192, which is equal to 3 Times the Square of 8 its Semi-diameter, be added 16, the Square of its Altitude, and the Sum 208, multiplied by 4 the Height, whose Product is 832, and that again by the decimal Fraction ,5236, then the Product 435,6352, is the Solidity of the Segment.

RULE II.

From 3 Times the Diameter of the entire Sphere, subtract twice the Height of the Segment, and multiply the Remains by the Squares of the Segment's Height; then this last Product being multiplied by the decimal Fraction 5236, and four Places of Figures cut off to the Right as before, the Product will be the Solidity of the Segment.

Sup-

Suppose the Height of a Segment of a Sphere be 7 Feet, whoſe Axis or Diameter of the Sphere be 20 Feet.

Then I ſay,

If from 60, which is equal to 3 Times the Axis or Diameter, be ſubtracted 14, equal to twice the Height of the Segment, the Remains will be 46.

And if 46 be multiplied by 49, the Square of the Segment's Height, and that Product 2254 by the decimal ,5236, the Product thereof *viz.* 1180,1944, is the Solidity.

Now 'tis evident,

That if the aireal Space within the Segment of a Hemiſphere, be conſidered as the Segment of a Sphere, and if the Segment of the Hemiſphere, together with its aireal Segment, be both together conſidered as a Segment of a Sphere, then ſubtracting the ſuppoſed Solidity of the aireal Segment from the Solidity of the aireal Segment, and Shell of the Hemiſphere conſidered as one Segment of a Sphere, the Remains or Difference will be the Solidity of the Shell of the Hemiſphere or Dome; as before was ſhewn of an entire Dome.

A Hemispheroid is a Concave generated by the Revolution of the quarter Part of an Ellipſis, about its longeſt Side, as an Axis, as has been before obſerved.

As I have before proved in Page 234, that a semi-elliptical Arch, on its short Diameter, contains more Abutment within its own Hanches, than a semi-circular Arch doth; so the hanch'd Part of a Hemispheroid, has a greater Resistence against the pressing Force of its Crown than that of a Hemisphere, and therefore wants no additional Abutment.

All hemispheroidical Domes may be built with Brick, with the Help of two Directors (without a Center) as the hemispherical Dome may be by a single Director. But as in the Hemisphere, one End of the Director must be always fixed at the Centre, here it must be otherwise, *viz.* A Floor of coarse Boards being first fixt exactly level with the Base, or springing of the Dome, (as Fig. II. Plate XIX.) thereon, about its Centre *i*, describe a Circle, as *e f g h*, whose Diameter shall be equal to *l m*, the Distance of the two Centres of the Hanches *k p* and *s n*, in the Section *k p q r s n*.

Now a circular Rim or Stop being fix'd down on the Circle *e f g h*, with a plumb Line so fix'd as to always hang over the Centre *i*; and two Directors being made, the one for the hanched Part, equal in Length to the Line *l n* or *l r*, and the other for the Crown Part, equal in Length to *o p* or *o r*, then the Work may be begun as follows, *viz.*

Apply

APPLY one End of the long Director constantly against the aforesaid circular Stop, so that its Side do but just touch the plumb Line over the Centre, and then the other End at the same time will give the exact Distance of the Inside of every Course, and its true sommering also, until the Work be carried up level with the Points *p* and *r*, when 'tis of no more Use: Because at the Heights of those Points the hanch Part of the Dome terminate, and the crowning Part begins, which is turned by Help of the short Director on the Centre *o* only, as directed for a Hemisphere.

NOW I say, if every Course of Bricks be thus well laid, in thin Courses of good Mortar, with their true Sommerings, firmly wedged behind, where the Forms of Bricks require it, then every Course will be an inverted Frustrum of a Cone, as in the Hemisphere, and therefore cannot fall; and more especially as that the resisting Power of the hanched Part is so greatly superior to the pressing Force of the Crown, as before proved.

HAD the Stone Dome which was begun and carried on for some Time over the new Library erected lately at *Oxford*, under the Direction of Mr. *Gibbs*, been well understood, it would not have fractured the Body of that Building; nor need it have been taken down and a Timber Dome substituted, to the Memory of its Architect, in its Place.

THE

The Price of Bricks and Mortar are herein the ſame as in hemiſpherical Domes, but the Workmanſhip is worth more Money, becauſe the Application of the long Director to the circular Rim, and centeral plumb Line, will imploy more Time than when 'tis fix'd to the Centre, as is done in the Building of a Hemiſphere; and therefore I allow the Workmanſhip of this kind of Brick Work at 3 *l.* 10 *s.* *per* Rod, excluſive of Scaffolding, making the Directors, fixing the Floor, *&c.*

THE convex or concave Superficies of a Hemiſpheroid, may be found very nearly as follows, *viz.*

AS the Radius of its Baſe is to twice the Area of that Circle over which it ſtands, ſo is the perpendicular Height of the Spheroid (from the Level of its Baſe to its Vertex) to its Superficies.

EXAMPLE.

SUPPOSE the Radius of the Baſe of a Spheroid be 10 Feet, and its perpendicular Height 15 Feet.

Then I ſay,

As 10 Feet the Radius, is to 628^{+} Feet (equal to twice the Area of the Circle over which their Spheroid ſtands) ſo is 15 the perpendicular Height, to 942 $\frac{5}{10}$ its Superficies.

BEFORE

Before the Solidity of a Brick hemiſpherodical Dome can be meaſured, the manner of finding the Solidity of a Spheroid muſt be known.

The Proportion that the Solidity of a Spheroid hath to the Solidity of its circumſcribing Cylinder, is, as 2 is to 3; the very ſame as of a Sphere to its circumſcribing Cylinder.

And therefore,

If the Area of a Circle, equal to the Baſe of a Semi-ſpheroid, be multiplied by $\frac{2}{3}$ Parts of its Perpendicular Height, the Product is its Solidity.

Example.

Let the Circle over which a Semiſpheroid ſtands, be 20 Feet Diameter, whoſe Area is $314\frac{2}{7}$ Feet, and the Height 15 Feet.

Then, $314\frac{2}{7}$ multiplied by 10, equal to 2 Thirds of 15 the given Height, the Product $3142\frac{6}{7}$ is the Solidity of the Semi-ſpheroid.

This being underſtood, the Menſuration of a hemiſpheroidical Dome of Brick Work, &c is very eaſy. For if the Air contained within its Concavity be conceived to be one Semi-ſpheroid, and that together with the Shell be conſidered as another, then ſubtracting the aireal Semiſpheroid from the whole, the Remains will be the Solidity of the Shell or Dome, as before was done for to find the Solidity of a hemiſpherical Shell.

Seg-

SEGMENTS of Spheriods and of ſpherodical Domes, are not ſo eaſily meaſured as their entire Bodies; but that nothing uſeful may be omitted herein, I will explain their Admeaſurement as follows, *viz.*

IF a Spheroid be inſcribed in a Sphere, as Fig. I. Plate XX. then every Segment of the Sphere is to every Segment of the Spheroid (being of the ſame Altitude) as the Solidity of the Sphere is to the Solidity of the Spheriod.

SUPPOSE a Sphere of 14 Feet Diameter, whoſe Solidity is $1437\frac{1}{3}$ Feet, have a Spheroid inſcribed therein, whoſe conjugate or ſhort Diameter is 10 Feet, and Solidity $733\frac{1}{7}$ Cube Feet.

NOW, the Solidities of the Sphere and of the Spheroid being thus given,

The ANOLOGY is,

As $1437\frac{1}{3}$ Feet, the Solidity of the Sphere, is to $735\frac{1}{7}$ Feet, the Solidity of the Spheroid;

So is the Solidity of any given Segment of the Sphere, to the Solidity of a Segment of the Spheroid.

NOW from hence 'tis evident, that before the Solidity of the Segment of a Spheroid can be found, the Solidity of a Segment of a Sphere

U of

of the ſame Altitude muſt be firſt known. To make this plain, I will give an

Example.

Suppose *a x*, Fig. I. Plate XX. to be a Spheroid, inſcribed within the Sphere of *a i x*, and let *c a d* be a given Segment of the Spheroid, whoſe Solidity is required.

Operation.

1ſt, Continue the right Line or Baſe of the given Segment, until it meet the Limits of the Sphere in the Points *b e*.

2dly, By Rule I. or II. Page 265, for to find the Solidity of any Segment of a Sphere, find the Solidity of the Segment *b a e*, which will be found to contain 169,6464.

Now, as 1437,$\frac{1}{3}$ Feet, the Solidity of the Sphere *f a i x*, is to 735,$\frac{1}{7}$ Feet, the Solidity of the incribed Spheroid; ſo is 169,6464 Feet the Solidity of the Segment of the Sphere *b a e*, to almoſt 87 Cube Feet, the Solidity of *c a d*, the Segment of the Spheriod.

Thus much for finding the Solidity of the Segment of a Spheroid, when its two Diameters (by which the Solidity of the Spheroid is found) are given: But when the perpendicular Height and Diameter of the Baſe of the Segment are only given, without knowing the Lengths of the two Diameters or Axis's, it is impracticable; be-

because Spheriods of the ſame Length are infinitely different in their conjugate Diameters.

N. B. The Solidity of a Segment of a hemiſpherodical Brick Dome, may be found by ſubſtracting the Segment of the aireal Spheroid from the aireal Segment and Shell conſidered together as one Segment, as before, in the Caſes of the hemiopherical and hemiſpherodical Domes.

Domes to Temples, *&c.* have very often a Polygon, as a Pentagon, Hexagon, Octagon, *&c.* for their Baſe, inſtead of a Circle, and are therefore called pentangular, hexangular, octangular, *&c.* ſpherical or ſpheroidical Domes, as repreſented in Plate XX.

As the Superfices of a Hemiſphere is equal to twice the Area of the Circle over which it ſtands, ſo is the Superficies of any angular Dome, equal to twice the Area of the Polygon over which it ſtands.

And,

As the Solidity of a Semiſphere is equal to two Thirds of its circumſcribing Cylinder, ſo the Solidity of an angular ſpherical Dome, is equal to two Thirds of its circumſcribing Priſim, be it pentangular, hexangular, octangular, *&c.*

And as the convex ſuperficies of a Semiſphere is to the convex Superficies of a Semi-

ſpheroid, (the Circles of their Baſes being both equal) as the Radius of their Baſes is to the perpendicular Height of the Semi-ſpheroid, ſo the convex Superficies of any ſpherical angular Dome, is to the ſuperficies of a ſpherodiacal angular Dome (the Polygons to each Baſe, being equal and the ſame) as the Semi-diameter of the ſpheriodical angular Dome, is to its perpendicular Height. And the ſame Rules which are here laid down for to find the Solidities of the Segments of a Sphere and a Spheroid, will alſo find the Solidity of the Segment of an angular Sphere and an angular Spheroid; and conſequently the Solidities of their Shells or Domes alſo.

N. B. *To well proportion a ſpheriodical Dome*—Divide the Diameter of its Baſe into 12 equal Parts; of which give 9 to the perpendicular Height, as Fig. z. Plate XX.

All kinds of angular Domes may be built without Centres, by the Help of Ribs only, being made equal to the inſide Curvature of their Hips, backed as circular Hip Rafters are, and placed at each Angle. For if every Courſe, between every two Ribs, be worked as the Joints or Courſes of a ſtraight Arch, and with a juſt Sommering, then every Courſe will form an inverted Fruſtrum of a Pyramid; and being firmly and cloſe worked, cannot have any Bearing on a Centre, was one to be erected for that Purpoſe; which is therefore needleſs.

In

In a Semi-ſpherical angular Dome, the Sommering of every Courſe of Bricks muſt have a ſtrict Recourſe to its Centre, and that as well on their Sides as on their upper Surfaces; which a Chalk Line, fix'd to the Centre, will in both Caſes and in every Courſe truly direct.

And as for to build a ſemi-ſperoidical Dome, there is a Neceſſity of fixing a Floor level with its Springing, for to fix on a circular Stop for the Director: So in like manner, when a ſemi-ſpheroidical angular Dome is to be erected, a Floor muſt be fixed, and a Polygon, ſimilar to the Baſe of the Dome, deſcribed thereon in the Place of the Circle; becauſe it is to the middle Point in each Side thereof, that the Courſes of Bricks in every oppoſite Side of the Dome, up unto the Top of the hanch'd Part, muſt ſommer.

When the hanched Part of a ſemi-ſpheroidical angular Dome is carried up to the Spring of its Crown, then the Sommering of every Courſe of Bricks contained therein, muſt have Recourſe to the Centre only, as before ſhewn in the ſemi-ſpherical angular Dome.

Both theſe kinds of Brick Domes are worth 3*l.* 10*s.* *per* Rod, for Workmanſhip only, excluſive of $4\frac{1}{2}$ *per* lineal Foot for cutting the Hips, and excluſive of the Expence of the

Flooring, Ribs, Scaffolding, and Materials; which laſt is the ſame as in common Grey-Stock Walling, the beating of the Mortar only excepted, as before noted.

CONICAL Brickwork is either an entire Cone, or a Fruſtrum thereof.

AN entire Cone is a Solid, which is generated by the Rotation of a right-angled plain Triangle, having one of its Sides fixed as an Axis, about which its Revolution is made, as Fig. I. Plate XXI.

THE Solidity of a Cone is equal to one third Part of the Solidity of its inſcribed Cylinder; and therefore it follows, that if the Area of a Cone's Baſe be multiplied by 1 third Part of the Cone's perpendicular Height, the Product will be the Solidity of the Cone.

SUPPOSE a Cone, whoſe Baſe is right-angled to its Axis, be 20 Feet in Diameter, and its Axis 30 Feet,

Then $314\frac{2}{7}$ Feet, the Area of its Baſe, being multiplied by 10 Feet, the 3d Part of its given Height, the Product $315\frac{6}{7}$ cubical Feet is the Solidity.

CONES of Brickwork well perform'd, with durable Materials, and well proportioned, have a very agreeable Effect on the Eye, when erected on a Church Steeple as a Spire: An Example of which was lately to be ſeen at

Chriſt-

Christ-Church in *Southwark*, when the old Church was ſtanding; which, at its re-building, I believe for want of knowing how to make ſecure the Foundation of the new Steeple, was omitted, for the Sake of leſs burthening it, and a Cupola, or *Lanthorn*, of the moſt inelegant Taſte introduced in its ſtead, not of much leſs Weight and Expence than a conical Spire would have been; for Spires of this kind need not exceed the Thickneſs of that at *Saliſbury Cathedral, which tho' upwards of* 200 *Feet in Height above the Tower, is but* 9 *Inches in Thickneſs.*

A Cone of Brickwork need not a Centre to build it on, becauſe as every Courſe of Bricks muſt have ſuch a Sommering as for their upper Surfaces to be exactly right-angled with the Outſide of the Cone, and every Brick therein to point directly to the Axis; as repreſented in Fig. II. Plate XXI. therefore every Courſe of Bricks will become an inverted Fruſtrum of a Cone; which being cloſely and truly worked, will ſo ſtrongly wedge themſelves together, that if a Centre was erected, they could not have any Bearing on it, and therefore would be uſeleſs.

Besides, if a Cone of Brickwork was to be built on a Centre, as the Courſes ſettled it would diſunite and ruin them by its Reſiſtance; becauſe in the Settlement every Courſe of Bricks will be forced out, and form a greater

Circle than that which it made when it was laid; which therefore in the Expanſion will diſunite all the upright Joints, and ſo ruin the whole.

As the Workmanſhip of this kind of Brick-work is perform'd ſometimes by the *Foot ſuperficial*, on the out Surface of the Cone, and ſometimes by the Cube Foot or Rod, I will therefore ſhew how to meaſure the Superficies and Solidity of the Shell of a Cone, as follows, *viz.*

SUPPOSE *a Brick Cone be* 20 *Feet Diameter at its Baſe, from Out to Out, its Axis* 100 *Feet in Height, and the Thickneſs of its Shell* 9 *Inches.*

N. B. THE Area, or Superficies of every Cone, whoſe Baſe is right-angled to its Axis, is equal to a Sector of a Circle, whoſe Radius is equal the Length of the Cone's Side, and whoſe Limb or curved Side is equal to the Circumference of the Cone's Baſe.

So the Sector *f a g d*, Fig. II. Plate XXI. is equal to the Superficies of the Cone *a d c*; becauſe the Radius *f a* is equal to the Side of the Cone *a d*, and the Curve *f g d* is equal to the Circumference of the Cone's Baſe *k e k i*.

NOW when the Diameter of the Baſe, and perpendicular Height of the Cone is given, the Length

Length of the Side of the Cone, as *a d*, must be found, before the Superficies of the Cone can be known; which may be found as follows, *viz.*

ADD the Square of the Semi-diameter of the Cone's Base, to the Square of the Height of its Axis; then the square Root of their Sum will be the Length of the Side of the Cone.

So the Square of *d e*, 10 Feet, is 100 Feet; and the Square *a e*, 100 Feet, is 10000 Feet; whose Sum is 10100 Feet; and whose square Root is very inconsiderably more than $100\frac{1}{2}$ Feet; which is the Radius of the Sector and Side of the Cone.

THE Side of the Cone being thus found, the next Thing to be known is the Circumference of the Cone's Base, which find as follows, *viz.*

AS 7 is to 22, so is 20 Feet the Diameter to $62\frac{6}{7}$ Feet the Circumference, which is the Length of the Curve *f g d*.

NOW, as is taught in Page 177, multiply $100\frac{1}{2}$ the Side of the Cone, by $31\frac{3}{7}$, the half of the Curve *f g d*, and the Product $3158\frac{1}{14}$ is the superficial Content of the Cone.

THE

THE Solidity of the Shell of a Cone is thus found, *viz.* Consider the Shell and its aireal Vacuity together, as a solid Cone; then substracting the aireal Cone from the supposed solid Cone, the Remains is the Solidity of the Shell.

BUT before the Solidity of the aireal Cone can be known, the Height of *x e* its Axis, must be found, as follows, *viz.* As the Triangles *a d e*, and *x z e* are similar, therefore,

AS *de* 10 Feet, is to *e a* 100 Feet; so is *z e* $9\frac{1}{2}$ Feet, to *e x* $92\frac{1}{2}$ Feet, which is the Height of the Aireal Cone.

NOW, the Solidities of the two Cones being found as before is taught; that of the supposed solid Cone will contain 10476 Cube Feet, and the Aireal Cone $8264\frac{2}{3}$, whose Difference $2211\frac{1}{3}$ Cube Feet is the Solidity of the Shell.

IF 2211 Cube Feet, be divided by 306, the Quotient 7, is the Number of Rods; and the remains 69 are Cube Feet.

THIS Kind of Brickwork being well performed, for the Workmanship, exclusive of the Expence of Scaffolding, and of raising up the Bricks and Mortar, is worth Six-pence *per* Cube Foot, or 7 *l.* 13 *s.* *per* Rod.—And the

Bricks

Bricks and Mortar about 8 *l.* 12 *s.*—So that the Expence of Bricks, Mortar and Labour, will be about 16 Guineas *per* Rod; and of a Cone of the aforesaid Dimensions, about 120 *l.* exclusive of Scaffolding, *&c.* as aforesaid.

When the upper Part of a Cone is taken away from the lower Part, the remaining Part is called a Frustrum, so in Fig. III. Plate XXI. the Part *a b c* being taken from the entire Cone *a d e*, the lower Part, or Remains *b c d e* is a Frustrum. This Kind of Brickwork is often used not only for Spires to Steeples, which are finished with Balls and Vanes, *&c.* and thereby made Frustrums as aforesaid, but for to sustain Cupola's over Timber Domes, as that of St. *Paul*'s, whose Cupola, on which the Cross is placed, is entirely sustain'd within the outward Dome, by a Brick Frustrum of a Cone, of 18 Inches in Thickness; so that the outward Dome sustains no Part of that Weight, and has no other Action there then that of its own bearing against it.

The Sides of Lime-Kilns, are also inverted Frustrums of Cones; but as they are generally within the Ground, and are performed but in an ordinary manner, are worth no more than Work and half in rough Walling, *vide Page* 84. But when Frustums are built for the support of Cupola's, *&c.* as aforesaid, they are worth the same Money as before said of an entire Cone.

When

When the Dimenſions of the Fruſtrum of a Cone is given, to find its external ſuperficial and ſolid Content, they are beſt and eaſieſt found, by firſt finding the Deficiency of the Cone, and then conſidering the whole as an entire Cone, ſubſtract the Superficies and Solidity of the imaginary Top from thoſe of the whole, and the remains, will be the Quantities of the Fruſtrum.

Suppose Fig. III. Plate XXI. to be the Fruſtrum of a Cone given, who Dimenſions are as follows, *viz.*

Diameter of it Baſe	30 Feet
Ditto of its Top	15
Perpendicular Height	60

To find *a b c*, the Deficiency.

Operation.

From *i e* 15 Feet the Semidiameter of the Baſe, ſubſtract *k c* 7 Feet 6 Inches the Semidiameter of the Top, and then the remains 7 Feet 6 Inches will be the Length of *x e*.

Now as *k c* is Parallel to *x e*, and *c x* is Parallel to *a k*, and the ſide of the Cone make the ſame Angle with the Line *k c*, as with *x e*, therefore the Triangles *a k c*, and *c x e*, are Similar; and therefore

As *x e* $7\frac{1}{2}$ Feet, is to *c x* 60 Feet;
So is *k c* $7\frac{1}{2}$ Feet, to *a k* 60 Feet.

Now

Now *a k* 60 Feet, added to *k i* 60 Feet, makes the Height of the entire Cone 120 Feet, with which proceed as follows, *viz.*

Firſt, (as before taught in Page 279) find the Length of *a e*, the ſide of the Cone, and on *a* deſcribe the Arch *e g*, which make equal to the Circumference of the Baſe, and draw the Line *a g* : Then the Sector *a e g* will be equal to the Superficies of the entire Cone.

Secondly, perform the ſame, with the Sector *a c f*, and then ſubſtracting the Area of the Sector *a c f* from the Area of the great Sector *a e g*, the Remains, will be the Area of *c f e g*, which is equal to the Superficies of the Fruſtrum.

So the Square of *i e* 15 Feet, is 225 Feet, and the Square of *a i* 120 Feet, is 14400 Feet, whoſe Sum is 14625, and whoſe ſquare Root is very near 121. Again,

If 121 be multiplied by $47\frac{1}{7}$, the half of $94\frac{2}{7}$, the Circumference of the Baſe, the Product $5604\frac{1}{7}$ Feet, is the Superficies of *a e g*, which is equal to the Superficies of the entire Cone.

And therefore,

If in like manner, the Area of the Sector *a c f* be found (which is equal to $1407\frac{1}{7}$ Feet) and be ſubſtracted from $5604\frac{1}{7}$ Feet, the Remains

mains 4287 Feet is the fuperficial Content of the Fruftrum.

And with regard to the finding of the Solidity of the Fruftrum, it is evident, that if from the Solidity of the entire Cone *a d e*, be fubtracted the deficient Cone *a b c*, the Remains or Difference will be the Solidity of the Fruftrum.

As for Example,

Firft, The Area of the Bafe *d e* is $707\frac{1}{7}$ Ft.
and $\frac{1}{3}$ of the Axis *a i* is 40

whofe Product is $28285\frac{1}{7}$ Ft.
which is the Solidity of an entire Cone.

Secondly, The Area of the Bafe *b c*, is $176\frac{11}{14}$
and $\frac{1}{3}$ of the Axis *a k*, is 20 Feet,
whofe Product $3535,\frac{1}{7}$ is the Solidity of the deficient Cone *a b c*.

Now, if from $28285,\frac{1}{7}$ the Solidity of the entire Cone *a d e*, be fubtracted $3535\frac{1}{7}$ the imaginary Solidity of the deficient Cone *a b c*, the Remains 24750 Cube Feet, will be the Solidity of the Fruftrum *b c d e*.

The Solidity of the Fruftrum of a Cone may be alfo found without completing the Cone as aforefaid, by the following Rule.

RULE.

Multiply the Area of the Bafe by the Area of the Top, and extract the fquare Root of their Product.

To

To the Sum of the two Area's aforeſaid, add the Square Root before found, and that Sum multiplied by 1 Third of the Fruſtrum's Length, will be the Solidity of the Fruſtrum.

So 707 $\frac{1}{7}$, the Area of the Baſe, multiplied by 176 $\frac{11}{14}$ the Area of the Top; the Product is 125012 $\frac{4}{7}$, whoſe ſquare Root is very near 353 $\frac{8}{14}$.

	Feet.
Now, if to the Area of the Baſe	707 $\frac{2}{14}$
and to the Area of the Top	176 $\frac{11}{14}$
be added the ſquare Root	353 $\frac{8}{14}$
their Sum is	1237 $\frac{7}{14}$

which being multiplied by 20, *viz.* 1 Third of 60 Feet, the Height *k i*, the Product will be 24750 Feet, which is equal to the Product before found in Page 284.

As I have thus made the Menſuration of the Fruſtrum of a Cone, I think very eaſy, I ſhall therefore conclude this Section with the following Obſervations, *viz.*

1ſt, That to meaſure the Solidity of the Shell of a Fruſtrum of a Cone, is no more than firſt to conſider the Shell and its aireal Fruſtrum together as a ſolid Fruſtrum, and then ſubtracting from that, the ſuppoſed Solidity of its aireal Fruſtrum, the Remains or Difference of Solidity, will be the Solidity of the

the Shell, as before ſhewn by many repeated Examples, for finding the Solidities of the Shells of Domes, Cones, *&c.*

2*dly*, That every thing which has been ſaid relating to Cones and their Fruſtrums, the ſame in every reſpect is to be underſtood in Brick Pyraments, and their Fruſtums, let their Baſes be a geometrical Square, Pentagon, Hexagon, Octagon, *&c.* unleſs in the Price of their Workmanſhip, to which muſt be added Sixpence *per* lineal Foot, for cutting and rubbing the angular Bricks of their Hips, as Fig. IV, *&c.*

Sect. XIV. *Of* Brick Ornaments.

These Ornaments are of various kinds, *viz.* Rubed only, and ſet in Front Mortar; or, gaged, rubed, and ſet in Putty.

Those which are rubbed only, are chiefly the Sides or Jaumbs of Windows, and the external Angles or Quoins of Buildings, which Workmen call *Returns*, and which generally conſiſt of alternate Courſes; the one a *Stretcher*, the other a *Header* and *Cloſier*, as Fig. I. Plate XXII. or the one a Stretcher and Header, and the other a Header, Cloſier and Stretcher, as Fig. II.

N. B.

N. B. A Stretcher is a Brick laid at Length, as thoſe numbered 3, 3, *&c.* a Header is the Head End of a Brick, as 2, 2, *&c.* and a Cloſier is Half a Header, as 1, 1, *&c.* as in Fig. I.

WHEN every 4 Courſes of a Brick Front riſe a Foot, then 8 Red-ſtock Bricks will do a ſuperficial Foot of *Return*; but when the Front Bricks are worked in thin Courſes of Mortar, ſo as for every 4 Courſes to riſe but 11 Inches, then every ſuperficial Foot will imploy nearly 9 Red-ſtock Bricks.

AS the Difference of the Price of Red-ſtock Bricks more than of Grey-ſtock Bricks, is nearly $\frac{8}{10}$ of a Farthing *per* Brick, therefore the Price of 9 Red-ſtocks, the Number *per* ſuperficial Foot, more than ſo many Grey-ſtocks, is 1 Penny and 3 Farthings; which, with regard to unavoidable Waſte, I allow at 2 Pence, and 3 Pence *per* Foot Workmanſhip, makes 5 Pence *per* ſuperficial Foot in the whole.

IN Walling, where every 4 Courſes, riſe 1 Foot.

$$\text{Every}\left\{\begin{array}{l} 5\frac{1}{3}\ \text{Stretchers} \\ 10\frac{2}{3}\ \text{Headers} \\ 21\frac{1}{3}\ \text{Cloſiers} \end{array}\right\}\text{make a ſuperficial Foot.}$$

But in Walling where every 4 Courſes riſe but 11 Inches, then

Every	6 Stretchers 12 Headers 24 Cloſiers	will but make a ſuperficial Foot.

The beſt way to meaſure theſe kinds of Works, is to number the Stretchers, Headers, and Cloſiers ſeparately, in one Window, *&c.* and then dividing their reſpective Quantities by the above reſpective Number that make a Foot, the Quotients added, will be the Number of ſuperficial Feet in the Window, *&c.* which being multiplied by the Number of Windows, *&c.* the Product will be the Content of the whole.

When Quoins of Buildings are Hexangular, Octangular, *&c.* as Fig. IV. Plate XXIII. there is more Trouble than where the Quoins are ſquare; becauſe, in all ſuch obtuſe angular Quoins, the Head of every Stretcher, that forms the Angle or Quoin, muſt be gag'd, cut, and rub'd, exactly to the Quantity of the Angle; which is worth 3 Pence *per* Foot lineal Meaſure for the Workmanſhip (as well when the whole is built with Grey-ſtocks as when ornamented with Red-ſtocks) *extra* more than 5 *d. per* Foot as aforeſaid.

Gaged and *rub'd Brick Ornaments* are of divers kinds, of which ſome are worked fluſh, in the ſame Plane of the common Work, as

Frizes

Frizes to Entablatures, Arches over the Heads of Windows, *&c.* and some Project before it, as Fascia's, Architraves, Rusticks, *&c.*

IN Ornaments which are worked flush, with the Plane of the common Work, the Excess in Price of Red-stocks, more than of the Grey-stocks or Place Bricks, must only be allowed for the Red-stocks: But in all Works that have Projection, as aforesaid, the Red-stock Bricks must be entirely paid for, with 25 *per Cent.* Profit, at a Halfpenny *per* Brick.

IN plain horizontal Brick Works, as a Frize to an Entablature, *&c.* there is not so much Waste in the Bricks, nor so much Time imploy'd in the Workmanship, as is in Arches over the Heads of Windows, and therefore is not so expensive.

IN all such horizontal Brick Works, where every 5 Courses rise 1 Foot in Height, every superficial Foot will imploy 10 Bricks (the Courses being laid Headers and Stretchers alternately) and the Expence, *per* superficial Foot, is as follows, *viz.*

The Excess in Prices of 10 Red-stock Bricks	0	0	2
Putty	0	0	1
Workmanship	0	0	10
Total	0	1	1

BUT in arched flush Ornaments, whose Courses sommer to one or more Centres, as straight, circular, elliptical, and Gothick Arches, a greater Number of Bricks and more Workmanship, *per* superficial Foot, is required; because every Brick must be cut and rub'd to its true Sommering, which causes not only considerable Waste in the Bricks, but also imploys more Time to gage, rub, and set them.

IN the straight Arch of a Window, as Fig. I. and II. Plate V. every superficial Foot will require 12 Bricks, as also will the Scheme Arch, Fig. I. the semicircular Arch, Fig. II. and the Gothick Arch, Fig. III. Plate XXIV. But elliptical Arches, as Fig. I. and II. and Gothick Arches, as Fig. III. Plate XXIII. must be allowed 16 Bricks *per* superficial Foot.

THE Expence, *per* superficial Foot, of *straight*, *Scheme*, *semicircular*, and *Gothick Arches*, consisting but of two Curves, as Fig. III. Plate XXIV. is as follows, *viz.*

The Excess in Price of 12 Red-stock Bricks	0	0	$2\frac{1}{2}$
Putty	0	0	1
Workmanship	0	1	0
Total	0	1	$3\frac{1}{2}$

BUT *Elliptical* Arches, as Fig. I. and II. and *Gothick* Arches, as Fig. III. Plate XXIII. have

have greater Waſte, and requires more Time in the ſommering of the Courſes.

THE Expence *per* ſuperficial Foot of theſe kinds of Arches is as follows, *viz.*

The Exceſs in Price of 16 Bricks which is the Number that every Foot will require, is	0	0	$3\frac{1}{2}$
Putty	0	0	1
Workmanſhip	0	1	3
Total	0	1	$7\frac{1}{2}$

FASCIAS's ſet in Putty, over Arches of Windows, are made either plain, of one entire Face, or enrich'd with plain Tenia's, or Saliant Courſes, as A B D, or with Moldings, as C E F G H I K, Plate XXV.

IN all theſe kinds of Brick Faſcia's, every ſuperficial Foot on the upright Face of the Faſcia, will require 10 Bricks, the Courſes being laid, Headers and Stretchers alternate, as aforeſaid; which muſt be rated at 1 Halfpenny *per* Brick, or 5 *d.* *per* Foot, on the Face, Pole Height; or if an Account of the Number of Bricks uſed in any Faſcia, be kept, then each Brick muſt be valued at a Halfpenny.

IN all plain Faſcia's, whether they conſiſt of one or more Faces, the Girt of the whole,

from the Upright of the Wall above, to the same underneath, must be taken for the Height of the Fascia, and the Workmanship thereof paid for *per* superficial Foot as follows, *viz.*

1*st*, For those of one Face only, as A, 11 *d.* *viz.* 10 *d.* for Workmanship, and 1 *d.* for Putty.

2*dly*, For those whose upper 3 Courses project over the lower, as B, 1 *s.* *viz.* 11 *d.* for Workmanship, and 1 *d.* for Putty.

3*dly*, For those whose Height is divided into two Faces, and each cap'd, as C, 1 *s.* 1 *d.* *viz.* 1 *s.* for Workmanship. and 1 *d.* for Putty.

4*thly*, For those which are enriched with Moldings, the plain Parts at 1 *s.* 1 *d.* and the Moldings at 1 *s.* 5 *d.* the Putty of both included.

Upright Rusticks to *Windows*, *Doors*, *Quoins*, *Pilasters*, *Piers* to Gates, *&c.* are either *square*, called *Rabbit Rusticks*, as those of the Pier, Fig. I. or *champhered*, as those of Fig. II. Plate XXVIII.

Square Rusticks of 5 Courses to a Foot in Height, will imply 10 Bricks *per* superficial Foot, and therefore their Value is as follows, *viz.*

10 Red-

10 Red-stock Bricks	0	0	5
Putty	0	0	1
Workmanship	0	1	0
Total	0	1	6

N. B. IN taking the Dimensions of the Superficies of a Rustick, observe not to omit the Edges; because the Workman has the same Right to be paid for their Workmanship, as he has for the upright Face: But when Dimensions are taken, for to find the Number of square Feet of Bricks only, then no regard must be taken of the Edges.

CHAMPHER'D RUSTICKS must also be allowed 10 Red-stock Bricks *per* superficial Foot, but their Workmanship is more than that of a square Rustick; that is, in Consideration that they are worked square, as a square Rustick, before their Edges are champher'd off, the Workman has therefore a Right to be paid for them; first, as a square Rustick, including the Edges, as aforesaid, at 1 *s.* 1 *d. per* Foot superficial, for Labour and Putty; and then 1 *s.* 4 *d. per* Foot superficial, as Molding *extra* for the champher'd Sides.

RUSTICKS, whose Courses have Sommering, as those in the Heads of square, semicircular and semi-elliptical Gates, Doors, and Windows, require more Bricks and more

Workmanſhip *per* ſuperficial Foot, than the preceding kinds.

Keying in, and Side Ruſticks, to ſquare headed and ſemicircular headed *Gates*, *Doors*, and *Windows*, are worth *per* ſuperficial Foot, as follows, *viz.*

12 Red-ſtocks	0	0	6
Putty	0	0	1
Workmanſhip	0	1	0
Total	0	1	7

But Brick Ruſticks in ſemi-elliptical headed Gates, Doors, or Windows, is worth more Money; becauſe there is not only a much greater unavoidable Waſte in the ſommering of the Bricks, and therefore muſt be allowed 16 *per* ſuperficial Foot: But the Trouble of cutting and rubing them to their Sommerings (which in one half Part of an elliptical Arch are all different) is much greater than thoſe of a Semi-circle, where the Sommering of every Courſe is the ſame; and therefore every ſuperficial Foot of Ruſticks in an elliptical Arch to a Gate, Door, or Window Head, is worth as follows, *viz.*

For	16 Bricks	0	0	8
	Putty	0	0	1
	Workmanſhip	0	1	6
	Total	0	2	3

Archi-

ARCHITRAVES to Doors and Windows are either ſtraight, circular, or elliptical; and the Number of Bricks required *per* ſuperficial Foot is as follows, *viz.*

$$\text{To a ſuperficial Foot of}\left\{\begin{array}{l}\text{ſtraight}\\\text{circular}\\\text{elliptical}\end{array}\right\}\begin{array}{c}10\\12\\16\end{array}\left\{\text{Bricks.}\right.$$

AND as a circular Architrave requires more Labour than a ſtraight Architrave; and an elliptical Architrave more than a circular, therefore the Value of their Workmanſhip muſt be different.

IN all ſtraight Architraves, the Courſes being parallel, they are therefore ſooner worked than a circular Architrave; becauſe the Sides of its Courſes muſt be firſt cut and rub'd to their Sommering before the Molding on the Face can be work'd; and the Trouble of working a circular Molding is more than of a ſtraight Molding.

STRAIGHT ARCHITRAVES, and all other ſtraight Moldings worked in Brick, is worth 1 *s.* 4 *d.* *per* ſuperficial Foot; but circular Architraves, and all other circular Moldings, are worth 2 *s.* and elliptical Architraves, and all other elliptical Moldings, 2 *s.* 6 *d.* for their Workmanſhip: And therefore the particular Expence *per* ſuperficial Foot, of theſe different Architraves, is as follows, *viz.*

I. *Of*

I. *Of* STRAIGHT ARCHITRAVES, *&c.*

10 Red-stock Bricks	0	0	5
Putty	0	0	1
Workmanship	0	1	4
Total	0	1	10

II. *Of* CIRCULAR ARCHITRAVES, *&c.*

12 Red-stock Bricks	0	0	6
Putty	0	0	1
Workmanship	0	2	0
Total	0	2	7

III. *Of* ELLIPTICAL ARCHITRAVES, *&c.*

16 Red-stock Bricks	0	0	8
Putty	0	0	1
Workmanship	0	2	6
Total	0	3	3

N. B. THE Girt of an Architrave must be taken, as well on its Back from the Face of the Tenia, to the Upright of the Building; as thorough every Part of its Face; but the Inside, or Return, to the Window Frame, must be taken seperately, as plain Work, *viz.* at 10 *d. per* superficial Foot for straight Work, 1 *s.* for circular, and 1 *s.* 3 *d.* for elliptical,

SHAFTS

SHAFTS of Pilasters, DADO's to their Pedestals, PANNELING, TABLES under Window Stools, *&c.* being all plain Work, and their Courses parallel, therefore in every of these Works, 12 Bricks laid Headers, Stretchers, and Closiers, in Courses alternate, and every 5 Courses to rise 1 Foot in Height, will make a superficial Foot of Work, and therefore their Expence *per* superficial Foot is as follows, *viz.*

10 Red-stock Bricks	0	0	5
Putty	0	0	1
Workmanship	0	0	10
Total	0	1	4

N. B. WHEN the Angles or Quoins of Pilasters, or Dado's to Pedestals, *&c.* are work'd with a Bead Molding, commonly called a Staff, that must be girt, and paid for *extra*, as Molding, at 1 *s.* 4 *d.* *per* superficial Foot.

N. B. THE Breadth of a Staff, or Bead Molding to a Pilaster, *&c.* is $\frac{1}{31}$ Part of the Pilaster's, *&c.* Diameter; and therefore if the Diameter of a Pilaster, *&c.* be divided into 31 equal Parts, the two outer Parts will be the Breadths of the two Staffs.

FOOT LACEINGS to Settings-off, ought to be consider'd as straight Molding; the Bricks to be paid for at a Halfpenny *per* Brick, and the

the Workmanship at 1 *s.* 4 *d. per* superficial Foot.

BRICK PIERS to Gates, at the Enterances into Noblemens Palaces, *&c.* when well performed, are very great Ornaments, and especially when their *Bases* and *Capitals* are made of *Portland*, *&c.* Stone; which is not only a fine Contrast in their Colour, but is a greater Preservative to the Shafts, from Rains, which can't affect them, so forcibly, as when made of Bricks.

THE Forms of Piers are always at the Pleasure of the Architect, *viz.* *First*, Plain, as Fig I. or pannel'd, as Fig. II. Plate XXVI.

Secondly, Rusticated, with square Rusticks, as Fig. I. or with champher'd Rusticks, as Fig. II. Plates XXVII, and XXVIII.

Thirdly, Octangular, as Fig. I. or circular, as Fig. II. Plate XXIX.

EVERY superficial Foot of these kinds of Brick Piers, will imploy 10 Bricks, Value 5 Pence; but the Expence of their Workmanship in every kind is different, as for Example,

First, WHEN the Body of a Pier is worked with a plain superficies (as Fig. I. Pl. XXVI.) its Value (exclusive of the Core) for Workmanship, is 10 *d. per* superficial Foot; and when

when the Quoins are beaded, they muſt be paid for, 1 *s.* 4 *d. per* ſuperficial Foot, *extra.*

Secondly, WHEN the Body of a Pier is pannelled in Front and Rear, as Fig. II. Pl. XXVI. the Margin about the Pannel, and the Pannel, as *a a*, is worth 1 *s.* and the Molding, as *b*, about the Pannel, 1 *s.* 4 *d. per* ſuperficial Foot; but the Returns of thoſe pannelled Sides, and all other plain Parts, are worth but 10 *d.* unleſs their Angles are beaded, which muſt be added *extra*, as aforeſaid.

Thirdly, WHEN the Body of a Pier is worked with Grey-ſtock Bricks, and ruſticated with ſquare Ruſticks of Red-ſtocks, as Fig. I. Plates XXVII and XXVIII. the Grey-ſtock Work is worth for Workmanſhip 5 *d.* and the Ruſticks 1 *s. per* ſuperficial Foot, 5 Courſes *per* Foot in Height, excluſive of the Core. But when the Body of a Pier is alſo built with Red-ſtocks, and gaged and rubed down to 5 Courſes, as aforeſaid, then the Workmanſhip of every ſuperficial Foot, in ſuch a Pier, is worth 1 *s.*

Fourthly, WHEN the Body of a Pier (or the Baſement of a Building) is ruſticated with champher'd Ruſticks, as Fig. II. Plates XXVI and XXVII. every Ruſtick muſt be firſt meaſured as a ſqure Ruſtick, including its Edges, as has been before noted, at 1 Shilling *per* ſuperficial Foot, and then the Champhering to be meaſured *extra*, as Molding, and added at 1 *s.* 4 *d. per* ſuperficial Foot.

Fifthly,

Fifthly, Octangular Piers, as Fig. I. Plate XXIX. are worth for the Workmanship of their Shafts or Bodies, 1 *s. per* Foot superficial, and 4½ Pence *per* Foot lineal, for cutting their obtuse Angles; and the Bodies of circular Piers, as Fig. II. for their Workmanship must be considered as molding at 2 *s. per* Foot superficial.

N. B. In all gaged and rubed Piers, the rubed Work is considered but at a Brick's Breadth in Thickness; so that all which is contained within that Thickness, is called the *Core*, which is to be measured seperately, and paid for as common Walling, the Workmanship at 5 Farthings, the Bricks at 3 *d.* and Mortar at 1 Penny *per* Cube Foot, which together is 5¼ *per* cube Foot, and something above 6 *l.* 13 *s. per* Rod.

Note also, That Grey-stock Bricks used to face the Bodies of Piers, must be rated at 1½ Farthings *per* Brick, or at 2 Pence Halfpenny *per* superficial Foot; aud the Mortar at 1 *d.* for every cube Foot of Brick Work contain'd in such Facing.

Niches are made in their Bodies, either semi-cylindrical, having a Semi-circle for the Base, as Fig. I. cover'd with the half Part of a Hemisphere, or Semi-cylindroidical, having a Semi-ellipsis for the Base, as Fig. II. Pl. XXXII. cover'd with the half Part of a Hemispheroid.

A s

As the Courſes in both the Bodies of theſe kinds of Niches are parallel, therefore in both Caſes 10 Bricks will face 1 ſuperficial Foot, and their Workmanſhip is worth 2 *s.* in circular, and 2 *s.* 6 *d.* in elliptical: But as the Courſes in their Heads have Sommering, from their Faces to their Centres, there is a very great and unavoideble Waſte in the Bricks, cauſed by their Diminution as they approach their Centre, and that more or leſs, according to the Magnitude of the Niches.

In a ſemi-hemiſpherical headed Nich, where all the Courſes are equal to one another, 12 Bricks *per* ſuperficial Foot, may be about ſufficient, and 16 *per* ſuperficial Foot for a ſemi-hemiſpherodical Head.

The Workmanſhip of a ſemi-hemiſpherical Head, being well perform'd, is worth 4 *s. per* ſuperficial Foot, and of a hemiſpheroidical Head 6 *s.* their upright Faces excepted, which are worth no more than the ſame kinds of Arches over the Heads of Windows, *viz.* 1 *s.* for the ſemi-circular, and 1 *s.* 3 *d.* for the ſemi-elliptical.

N. B. The Backs of Niches, worked up with common Work, is to be paid for ſeperately, at the ſame Rate as before ſaid, for the Cores of Piers.

Impost Moldings to Niches, and all other kinds of circular Moldings, are worth, for

for their Workmanship only, being well performed, 2 *s.* 8 *d.* *per* superficial Foot.

ARCADES of Brickwork being very beautiful, comes the next under Consideration.

THERE are 14 kinds of Pilasters or Piers to Arcades, *viz.* Three, which are plain; four, which are rusticated with square detatched Rusticks; three, with Rabbit Rustick; and as many with champher'd Rusticks.

IN the Designing or Forming of Pilasters to Arcades, Care must be taken so as to proportion them, that their Breadths always consist of some Number of half, or whole Brick in Breadth, as $1\frac{1}{2}$ Brick, 2 Bricks, $2\frac{1}{2}$ Bricks, 3 Bricks, *&c.* as represented in Plates XXX and XXXI. because when the Fronts and Sides of Pilasters are so contrived, there is no Waste in the Bricks, and are perform'd in much less Time than when they are not so, and the Work is more beautiful.

ARCADES are made either entirely with Grey-Stock Bricks, or with Red-stock Bricks, and sometimes with both.

THE Height of the Shaft of a Pilaster must always be so contrived, as to contain some certain Number of Courses of Bricks, and not to terminate its Height with a $\frac{1}{4}$, or $\frac{1}{2}$, *&c.* of a Brick, which has an ill Effect on the Eye: And

And when the Shafts of Pilaſters are to be ruſticated, with ſquare Ruſticks, detatched as Fig. I. Plate XXVII. the Intervals between the Ruſticks muſt be equal to the Height of a Ruſtick; and therefore, when the Height of a Shaft, is ſuch, as for its Courſes, not to form its Ruſticks and their Intervals without rubbing all the Courſes down, to diminiſh their Heights, and to bring them into Proportion, they muſt be done ſo.

THE ſeveral kinds of Pilaſters to Arcades, are as follows, *viz.*

I. *Of* PLAIN SHAFTS, *entirely of Grey-ſtock Bricks, as* Fig. I. Plate XXVI.

For Workmanſhip to the Facing *per* ſuperficial Foot	0	0	4
For Grey-ſtock Bricks to *ditto*, *per* ſuperficial Foot	0	0	2½
For Mortar to every cube Foot of the Out-ſide, conſidered at four Inches in Thickneſs	0	0	1
For Bricks *per* Cube Foot to the Core	0	0	3
For Mortar to *ditto*, *per* cube Foot	0	0	1
For Labourer *ditto*	0	0	1½

II. PLAIN SHAFTS *entirely of Red-ſtock Bricks, rubbed only, are worth as follows,* viz.

For Workmanſhip to the Out-ſide, *per* Foot ſuperficial	0	0	7
For Red-ſtock Bricks to *ditto*, Numb. 8. *per* ſuperficial Foot	0	0	4

For Mortar to every cube Foot in the Out-side, considered as before, at 4 Inches in Thickness	0	0	1
For Bricks *per* cub Foot to the Core	0	0	3
For Mortar to *ditto*, *per* cube Ft.	0	0	1
For Labour to *ditto*, *per* cube Ft.	0	0	1½

III. PLAIN *Shafts, entirely of gaged and rubbed Red-stock Bricks set in Putty, are worth as follows*, viz.

For Workmanship, *per* superficial Foot	0	0	10
For Red-stocks, Numb. 10, per superficial Foot	0	0	5
ForPutty, *per* Foot superficial	0	0	1
	0	1	4

And 5½ *d. per* cube Foot for the Materials and Labour to the Core, *extra*.

IV. RUSTICATED *with square Rusticks detatched, as* Fig. I. Plate XXVII. *entirely of Grey-stock Bricks, unrubbed, are worth as follows*, viz.

For Workmanship *per* Foot superficial to the Outside, 4 Inches in Thickness	0	0	5
For Grey-stockBricks,Numb. 8, *per* superficial Foot	0	0	2
For Mortar, *per* cube Foot, in the whole Pilaster	0	0	1
For Bricks, *per* cube Foot, to the Core	0	0	3

For

For Labour, *per* cube Foot, to the Core	0	0	1

V. GREY-STOCK *Pilasters, rusticated with detatched square Rusticks of Red-stocks, rubbed only, are worth as follows,* viz.

For the Workmanship of every superficial Foot of the Grey-stocks	0	0	4
For Grey-stocks, Numb. 8, to every superficial Foot	0	0	2
For the Workmanship of every superficial Foot or rubbed Rustick	0	0	7
For the Red-stock Bricks, Numb. 8, *per* Foot superficial, to the Rusticks	0	0	4
For Mortar, *per* cube Foot, in the entire Pilaster	0	0	1
For Bricks, *per* cube Foot, to the Core	0	0	3
For Labour, *per* cube Foot, to *ditto*	0	0	$1\frac{1}{2}$

VI. GREY-STOCK *Pilasters, rusticated with detatched square Rusticks, gaged and rubbed,* 5 *Courses to a Foot in Height, are worth as follows,* viz.

For the Workmanship of every Foot superficial of Grey-stocks	0	0	4
For Grey-stocks, Numb. 8, to every Foot superficial	0	0	2

For the Workmanſhip of every Foot ſuperficial of gaged and rubbed Ruſticks	0	1	0
For Red-ſtock Bricks Num. 10, *per* ſuperficial Foot	0	0	5
For Putty to ſet the Ruſticks in, *per* Foot ſuperficial	0	0	1
For Mortar, *per* cube Foot, to the whole Body of the Pilaſter	0	0	1
For Bricks, *per* cube Foot, to the Core	0	0	3
For Labour, *per* cube Foot, to the Core	0	0	$1\frac{1}{2}$

VII. RED-STOCK *Pilaſters, ruſticated with detatched ſquare Ruſticks, the whole, rubbed only, is worth as follows,* viz.

For the Workmanſhip of every ſuperficial Foot, both in the Shaft and Ruſticks.	0	0	7
For Red-ſtock Bricks, Numb. 8, *per* ſuperficial Foot	0	0	4
For Mortar, *per* cube Foot, in the whole Pilaſter	0	0	1
For Bricks and Labour, *per* cube Foot, in the Core	0	0	5

VIII. RED-STOCK *Pilaſters, ruſticated with detatched ſquare Ruſticks, the whole gaged and rubbed, and ſet in Putty, is worth as follows,* viz.

For the Workmanſhip of every Foor ſuperficial, both in ſhaft and Ruſticks	0	1	0

For

For Red-ſtock Bricks, Num. 10, *prr* Foot ſuperficial	0	0	5
For Putty, *per* Foot ſuperficial	0	0	1
For Materials and Labour, *per* cube Foot, to the Core.	0	0	5½

N. B. WHEN Pilaſters with detatched Ruſticks, as in theſe three laſt mentioned, have the Edges of their Ruſticks champhered, then to the above Values muſt be added as *extra* Work, 1 *s.* 4 *d. per* ſuperficial Foot, for the cutting of the Champhers; the Ruſticks being firſt meaſured as ſquare Work, including their Edges.

IX. GREY-STOCK *Pilaſters, Rabbit ruſticated, as* Fig. I. Plate XXVIII. *are worth as follows,* viz.

For Workmanſhip, *per* Foot ſuperficial	0	0	5
For Grey-ſtocks, Numb. 8, *per* Foot ſuperficial	0	0	2
For Mortar, *per* cube Foot in the whole Pilaſter	0	0	1
For Bricks and Labour, *per* cube Foot, in the Core.	0	0	4½

X. RED-STOCK *Pilaſters, Rabbit ruſticated, faced only, are worth as follows,* viz.

For Workmanſhip, *per* Foot ſuperficial	0	0	7
For Red-ſtock Bricks, Numb. 8, *per* Foot ſuperficial	0	0	4

For Mortar, *per* cube Foot, in the whole Pilaſter	0	0	1
For Bricks and Labour, *per* cube Foot, in the Core	0	0	4½

XI. RED-STOCK *Pilaſters, Rabbit ruſticated, gaged and rubbed, ſet in Putty, are worth as follows,* viz.

For Workmanſhip, *per* Foot ſuperficial	0	1	0
For Red-ſtock Bricks, Numb. 10, *per* Foot ſuperficial	0	0	5
For Putty, *per* Foot ſuperficial	0	0	1
For Materials and Labour, *per* cube Foot, in the Core	0	0	5½

N. B. In all kinds of Rabbit Ruſticks of Brick Work, the Height of the Rabbit, or Diſtance between every two Ruſticks, muſt be a Courſe of Bricks, and the Projection of the Ruſtick, a Half, or 3 quarter Part thereof at the moſt.

XII. GREY-STOCK *Pilaſters entirely ruſticated, with champher'd Ruſticks, are worth as follows,* viz.

For Workmanſhip, *per* Foot ſuperficial, every Ruſtick being firſt meaſured as a ſquare Ruſticks including all Edges.	0	0	5
For Grey-ſtock Bricks, Num. 8, *per* ſuperficial Foot	0	0	2

For

For every superficial Foot of Champhering in their Edges	0	1	4
For Mortar, *per* cube Foot, contained in the whole Pilaster	0	0	1
For Bricks and Labour, *per* cube Foot, in the Core	0	0	$4\frac{1}{1}$

XIII. RED-STOCK *Pilasters, entirely rusticated with champher'd Rusticks, rubbed only, are worth as follows*, viz.

For Workmanship, *per* Foot superficial, every Rustick being first measured as a square Rustick, Edges included	0	0	7
For Red-stock Bricks, Numb. 8. *per* superficial Foot	0	0	4
For every Foot superficial of Champhering	0	1	4
For Mortar, *per* cube Foot, contained in the whole Pilaster.	0	0	1
For Bricks and Labour *per* cube Foot to the Core	0	0	$4\frac{1}{2}$

XIV. RED-STOCK *Pilasters, entirely rusticated, with champhered Rusticks, rubed and gaged, and set in Putty, are worth as follows*, viz.

For Workmanship *per* Foot superficial, every Rustick being first measured as square work, including Edges	0	1	0
For every superficial Foot of Champher	0	1	4

For Red-ſtocks, Numb. 10, *per* Foot ſuperficial	0	0	3
For Putty *per* Foot ſuperficial	0	0	1
For Materials and Workmanſhip *per* cube Foot to the Core	0	0	5½

THE different Values of Pilaſters to Arcades being thus explained, there is nothing more to be known with regard to Arcades in general, than that the Expence of their Arches are the very ſame as thoſe to the Heads of Gates, Doors and Windows, before ſet forth in Page 289, and that the Brick Work in which they are contained, is to be valued as common Work, according to its Kind and Goodneſs of Performance, as before ſhewn in the firſt five Sections of this Chapter.

SECT. XV. *Of* PLAIN *and* PAN TILEING.

I. *Of* PLAIN TILEING.

HAVING in Page 17, ſhewn that plain Tiles are laid at a 6, 7, or 8 Inch Gage, and in Page 18, the Number of Tiles required *per* Square, at thoſe ſeveral Gages, the Exprnce of plain Tileing is very eaſily known in any Country, *&c.* For if to the prime Coſt of the Tiles *per* Square be added the prime Coſt of 2 Buſhels of Lime, 1 Buſhel of Sand. 1 Bundle

1 Bundle of Heart Oak Laths, 1 Peck of Oak Pins, 600 of fourpenny Nails, and 1 Day for a Bricklayer and Labourer, which are the Materials and Workmanſhip required for 1 ſquare of Tileing, the Sum will be the prime Coſt *per* Square.

As for Example, in *London* the Prices of the aforeſaid Materials and Workmanſhip, are as follows, *viz.*

768 Plain Tiles, to 1 Square, at a 6 Inch Gage, at 20 *s.* *per* Thouſand	0	15	4½
A Bundle of Heart Laths	0	1	8
600 of 4 *d.* Nails	0	1	0½
1 Peck of Pins	0	0	6
2 Buſhels Lime	0	0	9
1 Buſhel Sand	0	0	1½
1 Day a Bricklayer and a Lab.	0	5	0
Total	1	4	5½
Now, if to	0	19	6
the prime Coſt of the Materials,			
be added 12½ *per Cent.* Profit, *viz.*	0	2	5¼
and to the prime Coſt of Workm.	0	5	0
be added 25 *per Cent.* Profit, *viz.*	0	1	3
Then the Sum	1	8	2¼

is the real Value of a Square of plain Tileing at a 6 Inch Gage. And ſo in like manner a Square of plain Tileing, at a 7 Inch Gage, will be found to be 1 *l.* 4 *s.* 8½ *d.* and at an eight Inch Gage 1 *l.* 2 *s.* 11 *d.* the Difference *per* Square being chiefly in the Number of Tiles.

N. B.

N. B. BEFORE Contracts are made with Bricklayers, for plain Tileing, the Gage at which the Tiles are to be laid, must be particularly expressed, and then the Price to be agreed for accordingly.

Note also, That the best Mortar for laying of plain Tiles in, is that which is mixt with Horse-Dung, as mentioned in Page 46.

As I have thus shewn the Price *per* square for plain Tileing, when the Bricklayer finds all Materials and Workmanship, I shall now shew the Expence *per* Square, when Gentlemen find their own Materials, and the Bricklayer Workmanship only, *viz.*

I. *Of* PLAIN TILEING, 6 *Inch Gage.*

768 Plain Tiles, at 20 *s. per* Thousand	0	15	4½
1 Bundle Heart Laths	0	1	8
600 Fourpenny Nails	0	1	0½
2 Bushels Lime	0	0	9
1 Bushel Sand	0	0	1½
Pins	0	0	6
1 Bricklayer and Labourer 1 day	0	5	0
Profit thereon at 25 *per Cent.*	0	1	3
Total	1	5	8½

Which is 3 *s.* 6 *d. per* Square, less than 1 *l.* 8 *s.* 2 *d.* the Price *per* Square aforesaid.

II. *Of*

II. Of PLAIN TILEING, 7 *Inch Gage.*

655 Plain Tiles at 20 *s.* *per* Thousand	0	13	$1\frac{1}{4}$
1 Bundle Heart Laths	0	1	8
600 of Fourpenny Nails	0	1	$0\frac{1}{2}$
2 Bushels of Lime	0	0	9
1 Bushel Sand	0	0	$1\frac{1}{2}$
Pins	0	0	6
Workmanship *per* Square, with 25 *per Cent.* Profit	0	5	4
Total *per* Square	1	2	$6\frac{1}{4}$

Which is 3 *s.* 2 *d.* *per* Square less than 1 *l.* 5 *s.* 8 *d.* the Price *per* Square as aforesaid.

N. B. The Price of Workmanship herein is thus found, *viz.*

As 768 Tiles, in a Square of 6 Inch Gage, is to 6 *s.* 3 *d.* its Price of Workmanship; so is 655, the Number of Tiles in a Square of 7 In. Gage, to 5 *s.* 4 *d.* the Value of its Workmanship.

III. Of PLAIN TILEING, 8 *Inches Gage.*

576 Plain Tiles, at 20 *s.* *per* Thousand	0	11	$6\frac{1}{4}$
1 Bundle Heart Laths	0	1	8
600 of Fourpenny Nails	0	1	$0\frac{1}{2}$
2 Bushels of Lime	0	0	9
1 Bushel of Sand	0	0	$1\frac{1}{2}$
Pins	0	0	6
Workmanship, with 25 *per Cent.* Profit	0	4	9
Total *per* Square	1	0	$4\frac{1}{4}$

Which

Which is 2 *s.* $7\frac{1}{2}$ *d.* *per* Square leſs than 1 *l.* 2 *s.* 11 *d.* the Price *per* Square aforeſaid, the Workmanſhip herein being but 4 *s.* 9 *d.* *per* Square. For,

As 768 Tiles laying, is to 6 *s.* 3 *d.* as aforeſaid, ſo is the laying of 576 Tiles, to 4 *s.* 9 *d.*

II. *Of* PAN TILEING.

PAN TILES are uſed for to cover the Roofs of Buildings, which are of a low Pitch, where plain Tiles can't be ſo well uſed; for when a Roof of a low Pitch is covered with plain Tiles, driving Rains will get between and under them, which Pan Tiles, being well pointed within and without, will not admit. And beſides, as the Deſcent from the Edges of Pantiles, to the Middles of their Concavities, is much quicker than the Deſcent of the Roof, therefore the Rains haſtily deſcend from their Edges into their Middles, and ſo conſequently are carried off in much leſs Time than when they fall on plain Tileing, of the ſame Pitch or Deſcent, where the Surface being an inclined Plane, or nearly ſo, cannot collect the Rains into ſuch Streams, but ſuffers them to deſcend by their own Gravity in all Parts alike, which imploys a longer Time in their Deſcent.

PAN TILES laid at a 10 Inch Gage, a Square will imploy 180 Tiles, as before ſhewn in Page 22.

THE

THE Diſtance that Rafters ſhould be placed at, from the middle of one to the middle of the next, ſhould never exceed 15 Inches, and that as well for plain Tiles as Pan Tiles; becauſe when the Diſtance is greater, the Laths are apt to ſagg or fall inward between the Rafters, and eſpecially in plain Tileing, and thereby diſlocates the whole, and admits the Rains to enter.

EVERY Square of Pan Tileing at 10 Inch Gage, will take up 130 Feetrun of Lath; and as I have already noted in Page 52, that what is called a 10 Foot Lath will ſeldom work more than 9 Feet, therefore if 130 Feet, the Quantity required for 1 Square of Tileing, be divided by 9, the Quotient is $14\frac{4}{9}$, wherefore I allow 15 Laths *per* Square, which will take up 120 Sixpenny Nails. And the Expence of Pan Tiles, Laths and Nails, prime Coſt, is as follows, *viz.*

180 Pan Tiles at 6*s.* *per* Hund.	0	10	$9\frac{3}{4}$
15 Pantile Laths at $1\frac{1}{2}$*d.* *per* Lath	0	1	$10\frac{1}{2}$
120 Sixpenny Nails	0	0	3
Total prime Coſt	0	12	$10\frac{3}{4}$

Which, to avoid Fractions in Computation, I allow at 13 *s.* *per* Square; to which, adding Profit at $12\frac{1}{2}$ *per Cent*, *viz.* 1 *s.* $7\frac{1}{2}$ *d.* makes the Maſter's Price for Tiles, Lath, and Nails, 14 *s.* $7\frac{1}{2}$ *d.* *per* Square.

WHEN

When Pan Tiles are laid dry, the Workmanſhip for lathing and laying them, is worth 1 *s.* 6 *d. per* Square; but when laid in Lime and Hair, then the Workmanſhip is worth, if pointed without, 3 *s.* or, if pointed within, 3 *s.* 6 *d. per* Square, excluſive of Lime and Hair, which is worth 2 *s. per* Square more. And therefore it follows, That a Square of *Pan Tileing laid dry* is worth, for Materials and Labour, 16 *s.* $1\frac{1}{2}$ *d.* and when laid in, and pointed with Lime and Hair, 1 *l.* $1\frac{1}{2}$ *d.*

N. B. As glazed Pan Tiles are double the Price of common unglazed Pan Tiles, therefore when glazed Pan Tiles are to be uſed, the preceding Expence of common Pantiles *per* Square, muſt be doubled.

Note alſo, That in the Menſuration both of Plain Tileing, and Pan Tileing, every Footrun on the Ridge, Valleys and Hips (when any) is accounted a Foot ſuperficial of Work, *extra*, and the Tiles muſt be paid for at 1 *d. per* Tile, which is 4 *d. per* Hundred more than 25 *per Cent.* Profit.

Sect XVI. *Of* Brick *and* Tile *Pavements.*

I. *Of* Brick Pavements.

BRICK Pavements are generally uſed for the Floors of Vaults, Cellars, *&c.* and in *London* they are made either of Grey-ſtock Bricks,

Bricks, or Bricks made for this Purpoſe, called *Paving Bricks, vide* Page 13; and are laid either on their Flat Surface, or on their Edges.

If 1296, the ſquare Inches in a ſquare Yard, be divided by 36, the Area of a Grey-ſtock Brick in ſquare Inches laid flat, the Quotient 36 is the Number of Bricks *per* ſuperficial Yard laid flat.

And if 1296 be divided by $21\frac{1}{2}$, the Area of the Edge of a Grey-ſtock Brick, the Quotient $60\frac{1}{4}\frac{2}{3}$ is the Number of Bricks *per* ſuperficial Yard, laid on their Edges.

And ſo in like manner,

If 1296 be divided by $40\frac{1}{2}$ Inches, the Area of the Surface of a Paving Brick (as in Page 13) the Quotient 32 is the Number of Bricks *per* ſuperficial Yard, laid flat: And if 1296 be divided by $15\frac{3}{4}$, the Quotient 82, is the Number of Bricks *per* ſuperficial Yard laid on their Edges. *Vide* Page 14.

Now, the Number of Bricks required *per* Yard ſuperficial in the preceding Manners and Kinds being known, the Expence of Bricks and Workmanſhip may be eaſily known, as follows, *viz.*

By divers Experiments made, I have found, that a Bricklayer and a Labourer, in the common Courſe of working, without their Knowledge of my Remarks, have laid in Pavement 750 Bricks *per* Day (the Ground being before made level and fit for their Reception) for which

which Levelling, &c. no certain Price can be assign'd, and therefore must be done by the Day.

Now, as the prime Cost of laying 750 Bricks is 5 s. viz. 3 s. to the Bricklayer and 2 s. to the Labourer, the Expence prime Cost *per* Yard, is easily discovered, as follows, *viz.*

I. *Of the Price* per *Yard of* Grey-stock Brick Pavement, *laid flat.*

RULE.

As 750 Bricks laid *per* Day, is to 5 *s.* or 240 Farthings; so is 36 Bricks, the Number herein required *per* Yard, to $11\frac{13}{25}$ Farthings their Expence of Laying: Which, for to avoid Fractions in Computation, I allow at 3 *d.* *per* Yard.

Now, for to find the Value of 36 Grey-stock Bricks, say,

As 1000 Bricks is to 18 *s.* or 864 Farthings their prime Cost; so is 36 Bricks to almost 32 Farthings, their prime Cost.

And therefore the Expence *per* Yard is as follows, *viz.*

36 Grey-stock Bricks prime Cost	0	0	8
Profit thereon at $12\frac{1}{2}$ *per Cent.*	0	0	1
Workmanship, prime Cost	0	0	3
Profit thereon at 25 *per Cent.*	0	0	$0\frac{3}{4}$
Total	0	1	$0\frac{3}{4}$
Which may be allowed at	0	1	1

II. *Of*

II. *Of the Price* per *Yard of* Grey-stock Brick Pavement, *laid on Edges.*

RULE.

As 750 Bricks laid *per* Day, is to 5 *s.* or 240 Farthings, the Expence prime Coſt of their laying; ſo is 60 Bricks, the Number required herein *per* Yard, to nearly 20 Farthings, or 5 *d.* *per* Yard.

Now for to find the Value of 60 Grey-ſtock Bricks, ſay,

As 1000 Bricks is to 18 *s.* or 864 Farthings, their prime Coſt; ſo is 60 Bricks, to almoſt 52 Farthings, equal to 1 *s.* 1 *d.* their prime Coſt: And therefore the Expence *per* Yard is as follows, *viz.*

60 Grey-ſtock Bricks at 18 *s.* *per* Thouſand	0	1	1
Profit thereon at $12\frac{1}{2}$ *per Cent.*	0	0	$1\frac{5}{8}$
Workmanſhip	0	0	$5\frac{1}{4}$
Profit thereon at 25 *per Cent.*	0	0	1
Total	0	1	$9\frac{1}{8}$

III. *Of the Price* per *Yard, of* Brick Pavement, *laid with Paving Bricks flat.*

RULE.

As 750 Bricks, laid *per* Day, is to 240 Farthings, equal to 5 *s.* the Expence prime Coſt of their laying; ſo is 32, the Number required herein *per* Yard, to nearly $2\frac{1}{4}$ *d.* Which, to avoid Fractions, I allow at $2\frac{1}{2}$ *per* Yard.

Now for the Value of 32 Paving Bricks, ſay,

As 1000 Bricks is to 30*s.* or 1440 Farthings, their prime Coſt; ſo is 32 Bricks, the Number required *per* Yard, to a little more than 46 Farthings, equal to $11\frac{1}{2}$ *d.* their prime Coſt: And therefore the Expence *per* Yard is as follows, *viz.*

32 Paving Bricks, at 30 *s.* *per* Thouſand, prime Coſt	0	0	$11\frac{1}{2}$
Profit thereon at $12\frac{1}{2}$ *per Cent.*	0	0	$1\frac{1}{4}$
Workmanſhip, prime Coſt	0	0	$2\frac{1}{2}$
Profit thereon at 25 *per Cent.*	0	0	$0\frac{5}{8}$
Total	0	1	$4\frac{1}{8}$

IV. *Of the Price* per *Yard of* BRICK PAVEMENT, *laid with Paving Bricks on Edge.*

RULE.

As 750 Bricks laid *per* Day, is to 240 Farthings, or 5 *s.* the prime Coſt of their Laying; ſo is 82 Bricks, the Number herein required *per* Yard, to nearly 27 Farthings: But for Eaſe in Computation, I allow the Workmanſhip at 7 *d.* *per* Yard.

Now for to find the Value of 82 Paving Bricks, ſay,

As 1000 Bricks are to 30*s.* or 1440 Farthings, their prime Coſt; ſo is 82 Bricks the Number required herein *per* Yard, to ſomething more than 117 Farthings: Wherefore to avoid Fractions

tions in Computation, I allow them at 120 Farthings, or 2 *s.* 6 *d.* their prime Cost, and therefore the Expence *per* Yard is as follows, *viz.*

82 Paving Bricks at 30 *s.* *per* Thousand	0	2	6
Profit thereon, at $12\frac{1}{2}$ *per Cent.*	0	0	$3\frac{1}{4}$
Workmanship, prime Cost	0	0	7
Profit thereon, at 25 *per Cent*	0	0	$1\frac{1}{4}$
Total	0	3	$6\frac{1}{2}$

N. B. IN all these kinds of Brick Pavements 'tis best to lay them dry, and afterwards to wash in their Courses with Lime and Sand, made into a liquid Mortar, called *Grout*, or with Sand only.

PAVEMENTS of 10 Inch, or Foot Tiles, are often used for the Floors of Wash-Houses, Dairies, &c.

As those Tiles which are called 10 Inches, hold but $9\frac{1}{2}$ Inches square, therefore 1 Tile will cover but $90\frac{1}{4}$ superficial Inches, instead of 100, as they ought to do.

IF 1296, the Quadrature of a Yard in Inches, be divided by 90, the Number of square Inches in a 10 Inch Tile, the Quotient $14\frac{2}{5}$ is the Number of 10 Inch Tiles required to cover a superficial Yard: But to avoid Fractions, I will allow 15 Tiles *per* Yard.

AND as Foot Tiles hold but $11\frac{1}{2}$ Inches (as obſerved in Page 22) therefore 1 Tile will cover but $132\frac{1}{4}$ ſquare Inches inſtead of 144; and therefore, if 1296 be divided by 132, the Quotient is $9\frac{2}{11}$, wherefore I allow 10 Tiles *per* ſuperficial Yard.

As this kind of Pavement ſhould be well bedded in good Mortar, made of hot Lime and Brick-duſt or Sand, and takes up about the ſame Quantity as plain Tiling doth, *viz.* two Buſhels of Lime, with 1 Buſhel of Sand or Brick-duſt, to every Square of Work; and a Square of Work contains 11 ſquare Yards, the Expence *per* Yard is eaſily known, as follows, *viz.*

1. *Of* LIME *and* SAND *for* 11 *Yards.*

2 Buſhels of Lime	0	0	9
1 Buſhel of Sand	0	0	$1\frac{1}{2}$
	0	0	$10\frac{1}{2}$

Which is nearly 1 Penny *per* ſuperficial Yard.

2. *Of* LIME *and* BRICK-DUST *for* 11 Yards.

2 Buſhels of Lime	0	0	9
1 Buſhel of Brick-duſt	0	1	4
Total	0	2	1

Which

Which is ſomething more than $2\frac{1}{4}$ *d. per* Yard; but to avoid the Trouble of Fractions, I allow it at $2\frac{1}{2}$ *d. per* Yard prime Coſt.

Now the Expence *per* ſuperficial Yard is as follows, *viz.*

I. *Of* TEN-INCH TILE *Pavement, viz.*

15 Tiles at 8 *s. per* Hundred	0	1	$2\frac{1}{2}$
Profit thereon at $12\frac{1}{2}$ *per Cent.*	0	0	$1\frac{1}{4}$
Mortar of Lime and Sand	0	0	$1\frac{1}{2}$
Workmanſhip, prime Coſt	0	0	$4\frac{1}{2}$
Profit thereon, at 25 *per Cent.*	0	0	$1\frac{1}{8}$
Total	0	1	$11\frac{5}{8}$

Which I allow at 2 *s.* but when laid in Brick-duſt Mortar, at 2 *s.* 2 *d.* and when laid in Terrace, at 2 *s.* 8 *d.*

II. *Of* FOOT TILE PAVEMENT, *laid in Lime and Sand.*

10 Foot Tiles, at 20 *s. per* Hund.	0	2	0
Profit thereon, at $12\frac{1}{2}$ *per Cent.*	0	0	3
Mortar	0	0	$1\frac{1}{2}$
Workmanſhip	0	0	$4\frac{1}{2}$
Profit thereon, at 25 *per Cent.*	0	0	$1\frac{1}{8}$
Total	0	2	10
But when laid in Brick-duſt Mortar		3	0
And when in Terrace	0	3	7

Sect. XVII. *Of* Gally Tiles *for Chimneys*, &c.

THESE Kinds of Tiles have been of great Uſe for to ornament the *Covings of Chimneys*, *Sides of Cold Baths*, &c. and ſuch as are well painted, and neatly ſet, are very beautiful.

Their Sizes, Kinds, and Prices, being already ſet forth in Page 24, therefore I have nothing more to ſay here, but what relates to the Expence of the Plaiſter in which they are ſet, and of Workmanſhip to gage and ſet them; which is worth no more than 4 *d. per* 4 Tiles, which is called a Foot, tho' many Bricklayers, *&c.* demand and take 6 *d.* and therein exact 50 *per Cent.*

N. B. Old Gally Tiles taken down and re-ſet, are worth but 3 *d. per* 4 Tiles, or Foot, for Plaiſter and Setting, and old Tiles already taken down, 2 *d. per* Foot.

Note alſo, When Bricklayers, *&c.* undertake to find the Tiles, if 'tis agreed that they are to be *Dutch* made, beware that they are not mixed with *Engliſh* made Tiles, which is often done, and eſpecially thoſe that are entirely white, as being cheaper.

SECT. XVIII. *Of the* REPAIRS *of* BRICK-WORKS *and of* TILING, *&c.*

AS every Part of a Building begins to decay the very next Moment after 'tis finished, it is therefore that Repairs become necessary, when Decays in Materials are much advanced, in order to preserve and render them useful, until the *Iron Teeth of Time* shall have destroy'd the Union or Adhesion of their Parts, and reduced them to their first Principles of Matter, *viz.* EARTH and AIR.

BUT notwithstanding the early Decay of Materials in general, yet some decay more hastily than others, and particularly those which are most exposed to the Sun, Rains, and Air. For altho' the genial Heat of the Sun, assisted with Air and Moisture, gives Life and Growth to all kinds of Animals, Vegetables, *&c.* for certain Periods of Time, at the Will of the GREAT MAKER and PRESERVER of all Things; so at the Expirations of those Periods, when Growth ceases, then by his unalterable Laws, Decay commences, and the Sun, Rains, and Air, which before gave them their Life and Growth, do then in Conjunction, contrarily rend, and destroy them with rapid Force, until every of their constituent Parts are dissolved into their first Principles, as aforesaid; from which, very probably, new Productions do

and may ariſe, until Matter and Time be no more.

THE Kinds of Bricklayers Works moſt expoſed to the Sun, Rains, &c. are the Shafts of Chimneys, Tyling, Tops of Parapet Walls, *&c.* and Fronts of Buildings.

TOPS of Chimneys, being wholly expoſed, are ſooner affected by driving Rains, *&c.* than any other Brickwork, and eſpecially when the greedy Bricklayer don't allow Lime and Labour ſufficient to make the Mortar good; they, for the general Part of them, having a very great Regard to the following Proverb, *viz. That the Decay of Work is the Life of their Trade.*

MORTAR for the Shafts of Chimneys, Parapet Walls, Tops of Garden Walls, *&c.* ſhould be made with the ſharpeſt and cleaneſt Sand, from Earth or Loam, that can be got; and therefore the drift Sand of Rivers, where it can be had, is the beſt ſort of Sand for theſe Purpoſes that can be uſed. But where Sea-Coal Aſhes, clean from Wood Aſhes and Dirt, can be had, they are preferable to drift Sand, provided that the Mortar be well beat and uſed as baſtard Terrace.

This MORTAR *is thus made.*

To 2 heaped Buſhels of unſlacked *Lime*, put 1 heaped Buſhel of *Drift Sand* or *Sea-Coal*

Coal Ashes; which beat well, and work up hot, as 'tis made ready for Use.

THIS Mortar, when well made, is worth 7 *d. per* Hod; and the Workmanship for taking down the old Shafts, and for rebuilding them, is worth 4 *d. per* superficial Foot, the Widths and Scaffolding included.

N. B. *The Widths of Chimneys, are those Partitions, within Side, which separate the Funnels one from the other.*

Note also, That as the Shafts of Chimneys are built but a Brick's Breadth in Thickness (both Out-sides and Widths) therefore every superficial Foot, of Out-side, and of Widths, contain but $5\frac{1}{3}$ Bricks, whose Value, if of Grey-stocks, with $12\frac{1}{2}$ *per Cent.* Profit, is not quite 1 Penny Halfpenny, but to avoid Fractions in Computation, I allow it so; and the Mortar, *per* superficial Foot, I allow at 1 and $\frac{1}{2}$ Farthing, which is at the Rate of 1 *l.* 5 *s. per* Rod.

Now from hence, the Expence *per* superficial Foot, of Out-sides and of Widths, of an entire new Shaft, is as follows, *viz.*

Grey-stock Bricks, Numb. $5\frac{1}{3}$	0	0	$1\frac{1}{2}$
Mortar	0	0	$0\frac{3}{8}$
Workmanship	0	0	4
	0	0	$5\frac{7}{8}$

Which,

Which, to avoid Fractions in Computation, I allow at 6 *d.* but when in old Shafts the old Bricks are ſound and will ſerve again, then the Expence of Mortar and Workmanſhip *per* Foot ſuperficial, is but $4\frac{1}{2}$ *d.*

N. B. WHEN it happens, that ſome of the old Bricks are decay'd and unfit for Uſe, and that new Bricks muſt be uſed in their Steads, then the new Bricks being Grey-ſtocks, muſt be rated at a Farthing *per* Brick and no more, which is 20 *s.* and 10 *d. per* Thouſand, and 5 *d. per* Thouſand more than 18 *s.* with $12\frac{1}{2}$ *d. per Cent.* Profit thereon.

Note alſo, IF the Number of Bricks uſed in any Chimney Shaft, be divided by $5\frac{1}{3}$ the Number of Bricks imploy'd in a ſuperficial Foot, the Quotient will be the Number of ſuperficial Feet of Work done; and the Trouble of taking Dimenſions and of ſquaring them, is ſaved.

It is alſo to be noted, That ſometimes the Shafts of Chimneys are built by Rod Meaſure, when the Workmanſhip thereof is conſidered as if the Shaft was entirely ſolid, but the Materials thereof are to be conſidered as they are, and not otherwiſe.

TOPS of Parapet, *&c.* Walls, to take down and rebuild, are beſt done by Day Work, there being oftentimes conſiderable Trouble, which can't be foreſeen, or accounted for when done. And the new Bricks and Mortar imploy'd, muſt be

be charged as follows, *viz.* the Bricks at 1 Farthing *per* Brick, being Grey-ſtocks, and the Mortar at 1 Penny *per* Foot, at 1 Brick and a Half in Thickneſs, which is at the Rate of 1 *l.* 1 *s.* 2 *d.* *per* Rod, for the Mortar only.

FRONTS of old Houſes, when the Mortar is much decay'd, are frequently floated down, the old decay'd Mortar raked out, and the Joints freſh pointed anew; ſo that they look, when done, nearly as well as when firſt built.

THIS ſort of Work when well performed, is worth, for Mortar and Workmanſhip, *excluſive of Scaffolding*, 3 *d.* *per* ſuperficial Foot.

THE next kind of outward Repairs, is Plain and Pan Tiling.

I. *Of the Repairs of* PLAIN TILING.

THE Repairs of Plain Tiling is either *Mending* or *Ripping*.

MENDING of plain Tiling is not unlike a Tinker's mending or ſtopping of a Hole in a Kettle; for as ſure as a Bricklayer undertakes to ſtop or mend a Defect in plain Tiling, at the ſame Time, if 'tis poſſible, he will make another; ſo that there's no End of thoſe Expences, and therefore when this kind of Tiling wants much Repairing, 'tis always beſt and

and cheapeſt to rip, and new lay the whole; the Expence of which, *per* Square, is as follows, *viz.*

1 Bundle of Heart Laths	0	1	8
600 of Fourpenny Nails	0	1	$0\frac{1}{4}$
Pins	0	0	6
2 Buſhels of Lime	0	0	9
1 Buſhel of Sand	0	0	$1\frac{1}{2}$
Prime Coſt of Materials	0	4	1
Profit thereon at 25 *per Cent.*	0	0	$9\frac{1}{4}$
Workmanſhip to ſtrip, &c. *per* Sq.	0	1	0
Workmanſhip to lay Tiles	0	5	0
Profit thereon at 25 *per Cent.*	0	1	6
Total *per* Square	0	12	$4\frac{1}{4}$

Which I allow at 12*s.* 6*d.* and which Bricklayers frequently demand and take 17*s.* which is 4*s.* 6*d.* *per* Square *Exaction.*

N. B. 1*ſt*, When the Laths are ſound and good, and want no Repair, then from the aforeſaid Sum of 12*s.* 6*d.* muſt be ſubſtracted 3*s.* $10\frac{1}{2}$ (*viz.* 1*s.* 8*d.* for Laths, 1*s.* $0\frac{1}{4}$*d.* for Nails, and 6*d.* for Labour of Lathing) and then the Remains 8*s.* $7\frac{1}{2}$*d.* is the Value *per* Square.

2*dly*, WHEN old Laths are ſound and their Nails are decay'd, which often happens, then the

the old Laths must be new nailed, and to the above Sum of must be added

above Sum of	0	8	$7\frac{1}{2}$
For 600 of Fourpenny Nails	0	1	$0\frac{1}{2}$
Labour to new nail the old Laths	0	0	6
Profit thereon at 25 *per Cent.*	0	0	$4\frac{1}{2}$
Total Value *per* Square	0	10	$6\frac{1}{2}$

3*dly*, When the Laths are partly new and partly old, then to the above Sum of 10*s.* $6\frac{1}{2}$*d.* add for Half a Bundle of Laths, *per* Square, 1*s.* $0\frac{1}{2}$ *d.* more, which will make the whole 11*s.* 7*d.* *per* Square, exclusive of such new Tiles as may be wanted, which must be rated at 25*s.* *per* Thousand, and Ridge Tiles at 1*d.* *per* Tile.

N. B. As all new Tiles, for some Time after they are laid, will admit the Rains to penetrate them, therefore old Tiles, which have been seasoned by the Weather, are of greater Value than new Tiles.

II. *Of the Repairs of* PAN TILING.

WHEN Pan Tiles are sound, and the Lathing and Pointing is decay'd, so that the whole must be rip'd, then the Expence *per* Square is as follows, *viz.*

1. *When laid dry.*

15 Laths, prime Cost	0	1	10½
120 Sixpenny Nails, *ditto*	0	0	3
Profit thereon at 25 *per Cent.*	0	0	3¼
Workmanship to lath and lay the Tiles dry	0	1	6
Profit thereon at 25 *per Cent.*	0	0	9
Total *per* Square	0	4	8

To which must be added for such new Pan Tiles and Ridge Tiles, as may be wanted, 1 *d.* *per* Tile.

WHEN Pan Tiling is to be laid in, and pointed with Lime and Hair, then the Expence of Ripping, *per* Square, is as follows, *viz.*

15 Laths	0	1	10½
120 Sixpenny Nails	0	0	3
Profit thereon	0	0	3¼
Lime and Hair	0	2	0
Workmanship	0	3	6
	0	7	10¾

Which I allow at 8 *s.* *per* Square, exclusive of such Tiles as may be wanting, which are to be rated at 1 *d.* *per* Tile, as aforesaid.

But when the old Lathing and Nails are sound, and nothing but Workmanship is wanted, then its Value *per* Square is as follows, *viz.*

For Pan Tiling laid dry	0	1	6
Ditto laid in Lime and Hair pointed, the Lime and Hair included	0	5	6

As

As I have now gone through all the principal Works of a Bricklayer, thoſe of the *Jobbing Bricklayer* only excepted, which are almoſt endleſs to mention, I ſhall therefore conclude this Work with a Remark on the Quantity and Value of Mortar to be uſed in Jobbing Works, with any Number of Bricks, which may be a Means of preventing Frauds for the Future.

As I have demonſtrated in the firſt Part of this Chapter, in SECT. II, III, *&c.* That the Expence of Mortar required to a Rod of Brick Work, is under 20 *s.* *viz.* for 4500 Place Bricks; it is therefore very eaſy to find the Value of Mortar uſed in Jobbing, with any other Number of Bricks: And as in Jobbing Works there is oftentimes more Mortar uſed with Bricks than is uſually done in new Work, I will therefore allow, that the Mortar uſed in laying of 4500 Bricks in Jobbing Works, be worth 1 *l.* 5 *s.* which is nearly half as much more than its Value in laying the ſame Number of Bricks in common Walling.

Now the RULE *is,*

As 4500 Bricks, laid in 1 Rod of Jobbing Work, is to 25 *s.* the allowed Value of the Mortar in which they are laid, ſo is any given Number of Bricks to a 4th Number; which is the Value of Mortar neceſſary for them.

EXAM-

EXAMPLE.

What is the Value of ſo much Mortar, as is neceſſary to be uſed with 300 *Bricks?*

Anſwer, 1 *s.* 8 *d.*

For, as 4500 Bricks is to 1200 Farthings, or 25 *s.* ſo is 300 Bricks to 80 Farthings, equal to 20 Pence, which is nearly 7 *d. per* 100 Bricks.

Now, allowing in Jobbing Works, that to lay 500 Bricks *per Diem* be a Day's Work for a Bricklayer and a Labourer, then the Expence of Workmanſhip is 1 *s. per* Hundred.

And if to 1 *s.* 7 *d.* the Expence of Mortar and Workmanſhip *per* 100, be added 1 *s.* 10 *d.* the retale Price of a 100 Bricks, then the Sum 3 *s.* 5 *d.* (which for Eaſe in Computation, I allow at 3 *s.* 6 *d.*) is the honeſt Value *per* 100 Bricks for Materials and Labour. And therefore,

If in Jobbing Brick Works the Number of Bricks uſed be known, the Value of Materials and Workmanſhip may be alſo known. For,

As 100 Bricks, with Mortar and Workmanſhip, is to 3 *s.* 6 *d.* ſo is any other Number of Bricks to their Value, together with the Mortar and Workmanſhip included.

A SUM-

A SUMMARY of the various Prices of BRICKLAYERS WORKS, *viz.*

SECT. I. Of rough PLACE BRICK WALLING, Page 83. as *Foundations*, *Partition Walls*, &c.

I. BRICKS, Lime, Sand, and Labour.

	l.	*s.*	*d.*
Prime Coſt *per* Rod	4	13	$5\frac{1}{2}$
per Foot	0	0	$4\frac{1}{4}$
Ditto, with $12\frac{1}{2}$ *per Cent.* Profit on the Materials, and 25 *per Cent.* Profit on the Labour, *per* Rod	5	7	$2\frac{1}{2}$
per Foot, nearly	0	0	$4\frac{1}{4}$

II. LIME, Sand, and Labour only.

	l.	*s.*	*d.*
Prime Coſt *per* Rod	1	10	$5\frac{1}{2}$
per Foot, nearly	0	0	$1\frac{1}{2}$
Ditto, with the preceding Profits. *per* Rod	1	16	$4\frac{1}{2}$
per Foot nearly	0	0	$1\frac{1}{4}$

III. WORKMANSHIP only.

	l.	*s.*	*d.*
Prime Coſt *per* Rod	0	16	6
per Foot nearly	0	0	$0\frac{3}{4}$
Ditto, with 25 *per Cent.* Profit. *per* Rod	1	0	$7\frac{1}{2}$
per Foot nearly	0	0	1

IV. PLACE BRICKS only.

Prime Coft *per* Rod	3	3	0
per Foot nearly	0	0	3
Ditto, With $12\frac{1}{2}$ *per Cent.* Profit.			
per Rod	3	10	$10\frac{1}{2}$
per Foot nearly	0	0	$6\frac{1}{4}$

V. LIME only.

Prime Coft *per* Rod	0	10	10
per Foot nearly	0	0	$0\frac{1}{2}$
Ditto, With $12\frac{1}{2}$ *per Cent.* Profit.			
per Rod	0	12	$2\frac{1}{2}$
per Foot nearly	0	0	$0\frac{3}{4}$

VI. SAND only.

Prime Coft *per* Rod, p. 84.	0	3	$1\frac{1}{2}$
per Foot nearly	0	0	$0\frac{1}{5}$
Ditto, with $12\frac{1}{2}$ *per Cent.* Profit.			
per Rod	0	3	11
per Foot nearly	0	0	$0\frac{1}{4}$

VII. BRICKS, Lime, and Sand only.

Prime Coft *per* Rod	3	16	$11\frac{1}{2}$
per Foot nearly	0	0	$3\frac{1}{4}$
Ditto, with $12\frac{1}{2}$ *per Cent.* Profit.			
per Rod	4	6	7
per Foot nearly	0	0	4

VIII. LIME and Sand only.

Prime Coft *per* Rod	0	13	$11\frac{1}{2}$
per Foot nearly	0	0	$0\frac{3}{4}$
Ditto, with $12\frac{1}{2}$ *per Cent.* Profit.			
per Rod	0	15	$8\frac{1}{2}$
per Foot nearly	0	0	$0\frac{3}{4}$

IX.

IX. LIME and Sand made into Mortar.

Prime Coſt *per* Rod	0	15	5½
per Foot nearly	0	0	0¼
Ditto, with 12½ *per Cent.* Profit.			
per Rod	0	18	0
per Foot, ſomething more than	0	0	0¼

SECT. II. *Of* PLACE BRICK *Walling with common Joints, as Garden Walls,* &c. Page 88.

I. BRICKS, Lime, Sand and Labour.

Prime Coſt *per* Rod, p. 88.	5	4	0¼
per Foot nearly	0	0	4¼
Ditto, with 12½ *per Cent.* Profit on the Materials, and 25 *per Cent.* Profit on the Workmanſhip.			
per Rod	6	0	4¼
per Foot nearly	0	0	5½
☞ BUT in lofty Buildings, where much Scaffolding is uſed, 'tis worth *per* Rod	6	6	0

II. LIME, Sand, and Labour only.

Prime Coſt *per* Rod	2	1	0¼
per Foot nearly	0	0	2
Ditto, with the preceding Profits.			
per Rod	2	5	10¼
per Ft. little more than	0	0	2

III. WORKMANSHIP only.

Prime Cost *per* Rod, p. 88.	1	4	0
per Foot nearly	0	0	$1\frac{1}{4}$
Ditto, with 25 *per Cent*. profit.			
per Rod	1	10	0
per Foot nearly	0	0	$1\frac{1}{2}$

IV. PLACE BRICKS only.

Prime Cost *per* Rod	3	3	0
per Foot nearly	0	0	3
Ditto, with $12\frac{1}{2}$ *per Cent*. profit.			
per Rod	3	10	$10\frac{1}{2}$

V. LIME only.

Prime Cost *per* Rod	0	15	0
per Foot nearly	0	0	$0\frac{1}{4}$
Ditto, with $12\frac{1}{2}$ *per Cent*. Profit.			
per Rod	0	16	$10\frac{1}{2}$

VI. SAND only.

Prime Cost *per* Rod, p. 88.	0	2	$0\frac{1}{4}$
Ditto, with $12\frac{1}{2}$ *per Cent*. Profit.			
per Rod	0	2	3

VII. BRICKS, Lime, and Sand only.

Prime Cost *per* Rod, p. 89.	4	0	$0\frac{1}{4}$
per Foot nearly	0	0	$1\frac{1}{4}$
Ditto, with $12\frac{1}{2}$ *per Cent*. profit.			
per Rod	4	1	
per Foot nearly			

VIII.

VIII. LIME and Sand only.

Prime Cost *per* Rod	0	17	$0\frac{1}{4}$
Ditto, with $12\frac{1}{2}$ *per Cent.* Profit. *per* Rod	0	19	$1\frac{3}{4}$

IX. LIME and Sand made into Mortar.

Prime Cost *per* Rod	0	18	$6\frac{1}{4}$
Ditto Retail *per* Rod, p. 90.	1	1	$4\frac{1}{2}$

SECT. III. *Of Common* FRONTS, *faced with Grey-Stock Bricks, where every* 4 *Courses rise* 1 *Foot*, p. 94.

I. BRICKS, Lime, Sand, and Workmanship.

Prime Cost *per* Rod, according to the Manners of Fig. I, II, and VIII. Plate I. p. 94.	5	12	$0\frac{1}{2}$
Ditto, with $12\frac{1}{2}$ *per Cent.* Profit on the Materials, and 25 *per Cent.* Profit on the Workmanship.	6	7	2

II. BRICKS, Lime, Sand, and Workmanship.

Prime Cost *per* Rod, according to the Manners of Fig. V, VI, and VII. Plate I. p. 95.	5	13	0
Ditto, with the preceding Profits	6	10	6

III. LIME, Sand, and Workmanship.

Prime Cost *per* Rod, p. 94	2	1	$0\frac{1}{4}$
Ditto, with $12\frac{1}{2}$ *per Cent.* Profit on the Lime and Sand, and 25 *per Cent.* Profit on the Workmanship.	2	5	0

IV. WORKMANSHIP only.

Prime Cost *per* Rod	1	4	0
Ditto, with 25 *per Cent.* Profit	1	10	0

V. BRICKS only.

Prime Cost *per* Rod, according to the Manners of Fig. I, II, and VIII. Plate I. p. 94	3	11	0
Ditto, with 12½ *per Cent.* Profit	3	19	10½

VI. BRICKS only.

Prime Cost *per* Rod, according to Fig. V, VI, and VII. Plate I. p. 95.	3	12	0
Ditto, with 12½ *per Cent.* Profit.	4	1	0

VII. LIME only.

Prime Cost *per* Rod	0	15	0
Ditto, with 12½ *per Cent.* Profit	0	16	10½

VIII. SAND only.

Prime Cost *per* Rod	0	2	0¼
Ditto, with 12½ *per Cent.* Profit	0	2	3½

IX. BRICKS, Lime, and Sand.

Prime Cost *per* Rod	4	9	0
Ditto, with 12½ *per Cent.* Profit.	5	1	0¼

X. LIME and Sand.

Prime Cost *per* Rod	0	17	0¼
Ditto, with 12½ *per Cent.* Profit.	0	19	1¼

XI. LIME and Sand made into Mortar.

Prime Cost *per* Rod	0	18	$6\frac{1}{4}$
Ditto, Retail	1	1	$4\frac{3}{4}$

SECT. IV. *Of* FRONT WALLS *faced with Grey-stock Bricks, where every* 4 *Courses rise about* 11 *Inches*, p. 97.

I. BRICKS, Lime, Sand, and Workmanship.

Prime Cost *per* Rod	6	1	$10\frac{1}{4}$
Ditto, with the preceding Profits	7	0	$6\frac{1}{2}$

II. SAND, Lime, and Workmanship.

Prime Cost *per* Rod	1	6	6
Ditto, with the preceding Profits	2	12	$11\frac{1}{4}$

III. WORKMANSHIP only.

Prime Cost *per* Rod	1	6	6
Ditto, with 25 *per Cent*. Profit	1	13	$1\frac{1}{2}$

IV. BRICKS only.

Prime Cost *per* Rod, p. 97.	3	18	4
Ditto, with $12\frac{1}{2}$ *per Cent*. Profit	4	8	$1\frac{1}{4}$

V. LIME only.

Prime Cost *per* Rod	0	15	0
Ditto, with $12\frac{1}{2}$ *per Cent*. Profit	0	16	$10\frac{1}{2}$

VI SAND only.

Prime Cost *per* Rod	0	2	$0\frac{3}{4}$
Ditto, with $12\frac{1}{2}$ *per Cent*. Profit	0	2	$03\frac{1}{4}$

VII. Bricks, Lime, and Sand.

Prime Coſt *per* Rod	4	15	4¼
Ditto, with 12½ *per Cent*. Profit	5	7	4¼

VIII. Lime and Sand.

Prime Coſt *per* Rod	0	17	0¼
Ditto, with 12½ *per Cent*. Profit	0	19	1¾

IX. Lime and Sand made into Mortar.

Prime Coſt *per* Rod	0	18	6
Ditto, Retail	1	1	4¾

SECT. V. *Of* FRONT WALLING, &c. *faced with Grey-ſtock Bricks, where every four Courſes riſe about* 11 *Inches, with Tuck-and-pat Joints*, p. 98.

N. B. The Prices and Quantities of Bricks, Lime, Sand, and common Workmanſhip, are the ſame here as in SECT. IV. hereof; the only Difference being in the *Tuck-and-pat* Joints. So that the Expence *per* Rod of this kind of Walling amounts to 13 *l.* 6 *s.* 6 *d.* which is a very little more than 1 *s.* *per* ſuperficial Foot, at 1 Brick and Half in Thickneſs. But when this kind of Walling is neatly worked with jointed Courſes in the uſual manner, then the Amount *per* Rod is but 6*l.* 14*s.* 2*d.* as in p. 101, which is but 1*s.* 8*d.* more than Half the preceding.

SECT.

SECT. VI. *Of* BRICK WALLING *faced on both Sides with Grey-stock Bricks, worked with common jointed Courses, and with Tuck-and-pat Courses*, p. 102.

I. Bricks, Mortar and Labour, with common Joints.

Prime Cost *per* Rod, p. 103.	7	18	2
Ditto, with the aforesaid Profits	9	4	2

II. Mortar and Labour, with common Joints.

Prime Cost *per* Rod	3	10	0
Ditto, with the aforesaid Profits	3	18	9

III. Workmanship only, with common jointed Courses.

Prime Cost *per* Rod	2	10	0
Ditto, with 25 *per Cent.* Profit	3	2	6

IV. Workmanship only, with Tuck-and-pat Courses.

Per Rod	16	14	0
Per superficial Foot at 1 Brick and Half in Thickness, nearly	0	1	3

V. Bricks, Mortar, and Workmanship, with Tuck-and-pat Courses, p. 103.

Per Rod	22	16	0
Per Foot, at Brick and Half in Thickness, nearly	0	1	9

VI.

VI. Bricks only, p. 103.

Prime coſt *per* Rod	4	8	2
Ditto, with 12½ *per Cent.* Profit	4	11	0¼

VII. Mortar only, p. 103.

Prime Coſt *per* Rod	1	0	0
Ditto, with 12½ *per Cent.* Profit	1	2	6

SECT. VII. *Of Red-Stock Brick Fronts, rubbed and edged only, with common jointed and with Tuck-and-pat Courſes,* p. 127.

I. Bricks, Mortar, and Workmanſhip, with common jointed Courſes.

Prime Coſt *per* Rod	11	10	3
Ditto, per Foot	0	0	10¼
Ditto, per Rod, with the preceding Profits	13	12	2
Per Rod, with Tuck-and-pat Courſes	20	8	2½
Per Foot *ditto*	0	1	6

II. Mortar and Workmanſhip, with common Joints.

Prime Coſt *per* Rod	6	2	6
Ditto, with the preceding Profits	6	11	4½

III.

III. Mortar and Workmanſhip, with Tuck-and-pat Courſes.

Per Rod, Profits included	13	17	10½
Viz. Mortar	0	19	1½
Common Work	2	6	3
Rubbing	3	16	6
Tuck-and-pat	6	16	0
Total	13	17	10½

IV. Workmanſhip only, with common jointed Courſes.

Prime Coſt *per* Rod	4	5	0
Ditto, with 25 *per Cent.* Profit	5	6	3

V. Workmanſhip only, with Tuck-and-pat Courſes.

Per Rod	12	2	3

VI. Bricks only.

Prime Coſt *per* Rod	5	7	9
Ditto, with 25 *per Cent.* Profit	6	14	10¼

VII. Mortar only.

Prime Coſt *per* Rod	0	17	0
Ditto, with 12½ *per Cent.* Profit	0	19	1½

SECT. VIII. *Of Party-Walls between Court-Yards, faced on both Sides with Red-Stock Bricks, rubbed and edged*, p. 128.

I. Bricks, Mortar, and Workmanſhip, with common jointed Courſes.

Prime Coſt *per* Rod	17	10	0
Ditto, with the aforeſaid Profits	20	17	0

II.

II. Bricks, Mortar, and Workmanſhip, with Tuck-and-pat Courſes.

Per Rod, Profits included as aforeſaid	34	9	0

III. Mortar and Workmanſhip, with common jointed Courſes.

Prime coſt *per* Rod	10	3	0
Ditto, with the aforeſaid Profits	12	11	$7\frac{1}{2}$

IV. Mortar and Workmanſhip, with Tuck-and-pat Courſes.

Per Rod	26	3	$7\frac{1}{2}$

V. Workmanſhip only, with common jointed Courſes.

Prime Coſt *per* Rod	9	6	0
Ditto, with 25 *per Cent.* Profit	11	12	6

VI. Workmanſhip only, with Tuck-and-pat Courſes.

Per Rod	25	4	6

VII. Bricks only.

Prime Coſt *per* Rod	7	7	0
Ditto, with $12\frac{1}{2}$ *per Cent.* Profit	8	5	$4\frac{1}{2}$

VIII. Mortar only.

Prime Coſt *per* Rod	0	17	0
Ditto, with $12\frac{1}{2}$ *per Cent.* Profit	0	19	$1\frac{1}{2}$

SECT.

SECT. IX. *Of plain Walling, faced with gaged and rubbed Red-Stock Bricks, ſet in Putty,* p. 130.

Bricks, Mortar, Putty and Workmanſhip.

Per Rod	21	16	9
Per Foot on the Surface, at Brick and Half thick	0	1	8

SECT. X. *Of common Grey-Stock Brick Walling, worked entirely with Terrace Mortar,* p. 136.

I. Bricks, Mortar, and Workmanſhip.

Prime Coſt *per* Rod	13	2	8
Ditto, with the aforeſaid Profit	15	5	0

II. Mortar and Workmanſhip.

Prime Coſt per Rod	8	15	0
Ditto, with the aforeſaid Profits	10	5	$7\frac{1}{2}$

III. Workmanſhip only, to beat Terrace and lay Bricks.

Prime Coſt *per* Rod	3	10	0
Ditto, with the aforeſaid Profits	4	7	6

IV. Terrace, Lime, and Beating.

Prime Coſt *per* Rod	7	10	0
Ditto, with the aforeſaid Profits	8	14	$4\frac{1}{2}$

V. Bricks

V. Bricks only.

Prime Coſt *per* Rod	4	7	8
Ditto, with 12½ *per Cent.* Profit	4	18	5½

VI. Lime only.

Prime Coſt *per* Rod	0	15	0
Ditto, with 12½ *per Cent.* Profit	0	16	10½

VII. Terrace only.

Prime Coſt *per* Rod	4	10	0
Ditto, with 12½ *per Cent.* Profit.	5	1	3

SECT. XI. *Of common Grey-Stock Brick Walling, worked* 1 *Brick Length only, in Terrace Mortar, and a Brick's Breadth in common Lime Mortar.*

I. Bricks, Mortars, and Workmanſhip.

Prime Coſt *per* Rod	10	18	9½
Ditto, with the aforeſaid Profits	12	6	2

II. Mortars and Workmanſhip.

Prime Coſt *per* Rod	5	12	1½
Ditto, with the aforeſaid Profits	7	15	1

III. Workmanſhip only, to beat the Terrace and lay Bricks.

Prime Coſt *per* Rod	2	15	6
Ditto, with 25 *per Cent.* Profit.	3	8	10½

IV.

IV. Terrace, Lime, and Beating.

Prime Coſt *per* Rod	5	1	3
Ditto, with the aforeſaid Profits	5	17	6

V. Bricks only.

Prime Coſt *per* Rod	4	7	8
Ditto, with 12½ *per Cent.* Profit	4	18	5½

VI. Lime only.

Prime Coſt *per* Rod	0	15	0
Ditto, with 12½ *per Cent.* Profit	0	16	10½

VII. Terrace only.

Prime Coſt *per* Rod	3	0	0
Ditto, with 12½ *per Cent.* Profit	3	7	6

SECT. XII. *Of common Grey-Stock Brick Walling, having a Brick's Breadth only laid in Terrace Mortar, and a Brick's Length in common Mortar.* p. 139.

I. Bricks, Mortars, and Workmanſhip.

Prime Coſt *per* Rod	8	14	1
Ditto, with the aforeſaid Profits	10	2	10

II. Mortars and Workmanſhip

Prime Coſt *per* Rod	4	7	0
Ditto, with the aforeſaid Profits	5	4	0

III.

III. Workmanſhip only, to beat the Terrace and lay Bricks.

Prime Coſt *per* Rod	2	1	0
Ditto, with 25 *per Cent*. Profit.	2	11	3

IV. Terrace, Lime, and Beating.

Prime Coſt *per* Rod	3	0	0
Ditto, with the aforeſaid Profits	3	9	4½

V. Bricks only.

Prime Coſt *per* Rod	4	7	8
Ditto, with 12½ *per Cent*. Profit	4	18	5½

VI. Lime only.

Prime Coſt *per* Rod	0	15	0
Ditto, with 22½ *per Cent*. Profit.	0	16	10½

VII. Terrace only.

Prime Coſt *per* Rod	1	10	0
Ditto, with 12½ *per Cent*. Profit	1	13	9

SECT. XIII. *Of Erect Circular, and Elliptical Walling.* p. 143.

I. Circular, &c. rough Place-Brick Walling in Foundations, &c. p. 144.

Prime Coſt *per* Rod	5	3	2½
Viz. Materials	3	19	5½
Workmanſhip	1	4	9
Ditto, with the preceding Profits.			
Viz. Materials	4	10	0
Workmanſhip	1	11	6

II. Cir-

II. Circular Place-Brick Walling with common jointed Courses. p. 144.

Prime Cost *per* Rod	5	18	0
Viz. Materials	4	2	0
Workmanship	1	16	0
Ditto, with the preceding Profits	6	17	3
Viz. Materials	4	12	3
Workmanship	2	5	0

III. Circular Place-Brick Walling, faced on one Side with Grey-Stock Bricks, with common jointed Courses. p. 146.

Prime Cost *per* Rod	6	14	2
Viz. Materials	4	18	2
Workmanship	1	16	0
Ditto, with the preceding Profits	7	15	6
Viz. Materials	5	10	6
Workmanship	2	5	0

N. B. When this kind of Walling is worked with Tuck-and-pat Courses, then to the above must be added,

Per superficial Foot	0	0	6
Per Rod	6	16	0

IV. Circular Grey-Stock Walling, with common jointed Courses. p. 147.

Prime Cost *per* Rod	8	11	9½
Viz. Materials	5	6	9½
Workmanship	3	5	0
Ditto, with the preceding Profits	10	2	2½
Viz. Materials	6	1	0
Workmanship	4	1	3

N. B. When this kind of Walling is worked with Tuck-and-pat Courses, then add to the above, *per* Foot superficial 0 0 6

per Rod	6	16	0

V. Circular Place-Brick Walling, faced with Red-Stock Bricks, rubbed and edged, with common jointed Courfes. p. 149.

Prime Coft *per* Rod	13	6	6½
Viz. Materials	6	13	6½
Workmanfhip	6	13	0
Ditto, with the aforefaid Profits	15	16	6
Viz. Materials	7	10	3
Workmanfhip	8	6	3

N. B. When this kind of Walling is worked with Tuck-and-pat Courfes, then to the above muft be added,

per Foot fuperficial	0	0	6
per Rod	6	16	0

Which is 2*s.* 6*d.* more than the prime Coft of the Materials.

VI. Circular Red-Stock Brick Walling, entirely of Red-Stocks, rubbed and edged.

Prime Coft *per* Rod	18	6	6¼
Viz. Materials	8	5	6¼
Workmanfhip	10	1	0
Ditto, with the aforefaid Profits	21	17	5½
Viz. Materials	9	6	2½
Workmanfhip	12	11	3

N. B. When Walling of this kind is worked with Tuck-and-pat Courfes on both Sides, then to the above muft be added,

per Foot fuperficial	0	0	6
per Rod, both Sides included	13	12	0

VII. Circular Place-Brick Walling, faced on one Side with Red-Stock Bricks, and rubbed and fet in Putty. p. 152.

Prime coft *per* Rod	22	0	1½

Viz.

Viz. Materials	7	7	1½
Workmanſhip	14	13	0
Ditto, with the preceding Profits	22	18	6

VIII. Circular Red-Stock Brick Walling, faced on both Sides, gaged and rubbed, ſet in Putty.

Prime Coſt per Rod	36	6	6
Viz. Materials	9	2	6
Workmanſhip	27	4	0
Ditto, with the aforeſaid Profits	37	9	4

IX. Circular Place-Brick Walling, faced on one Side with Grey-Stock Bricks, laid a Brick's Breadth in Terrace Mortar, and a Brick's Length in common Mortar.

Prime Coſt *per* Rod	8	6	7¼
Viz. Materials	6	4	7¼
Workmanſhip	2	2	0
Ditto, with the aforeſaid Profits	9	12	4½
Viz. Materials	7	0	1½
Workmanſhip	2	12	3

X. Circular Walling, two third Parts of Grey-Stock Bricks and one third Part of Place-Bricks; the Grey-Stocks laid nine Inches in Terrace, the other half Brick of Place-Bricks in common Mortar.

Prime Coſt *per* Rod	10	9	11
Viz. Materials	7	17	5
Workmanſhip	2	12	6
Ditto, with the aforeſaid Profits	12	2	8½
Viz. Materials	8	17	1
Workmanſhip	3	5	7

XI. Circular Grey-Stock Walling, laid entirely in Terrace Mortar.

Prime Coſt *per* Rod	11	4	2

Viz.	Materials	8	8	8
	Workmanſhip	2	15	6
Ditto, with the preceding Profits		12	19	$1\frac{1}{2}$
Viz.	Materials	9	9	9
	Workmanſhip	3	9	$4\frac{1}{2}$

SECT. XIV. *Of Brick Arches to Vaults, Cellars, Cielings,* &c. p. 219.

I. Of ſtraight arched Vaults, *&c.* Materials the ſame *per* Rod as in common Walling.

Workmanſhip *per* Rod	2	5	0

II. Of groined arched Vaults, *&c.*

Materials *per* Rod as aforeſaid.

Workmanſhip *per* Rod	3	0	0

Excluſive of 6 *d. per* lineal Foot, for cutting the Angles, *&c.*

SECT. XV. *Of Brick arched Cielings and Floors, for the Prevention of Fire.* p. 250.

Expence *per* Rod	9	10	$10\frac{1}{2}$
per Square	8	8	0

Excluſive of the Centring.

SECT. XVI. *Of Groin'd Cielings.* p. 257.

Materials *per* Rod	9	12	0
Labour *per* Rod	3	0	0

Excluſive of Centring and o fCutting the Angles of the Groins.

SECT.

SECT. XVII. *Of Hemispherical and Hemispheroidical Domes.*

Workmanship *per* Rod

To	Hemispherical	Domes	3	0	0
	Hemispheroidical		3	10	0

N. B. Materials in both Cases are the same *per* Rod as in common Walling.

SECT. XVIII. *Of Brick Cones and their Frustrums, for Spires to Church Steeples,* &c. p. 281.

Workmanship only, *per* Rod	7	13	0
per Cube Foot	0	0	6
Materials only	8	12	0
Materials and Labour *per* Rod	16	16	0

SECT. XIX. *Of Brick Ornaments.*

I. Of rubbed square Returns to Quoins, *&c.* p. 286.

Bricks, N° 9. *per* Foot superficial	0	0	2
Workmanship	0	0	3

II. Of rubbed octangular Returns to Quoins, *&c.* p. 288.

Excess in Price of 9 Bricks *per* Foot superficial	0	0	2
Rubbing as common Work, *per* superficial Foot	0	0	3
Cutting and rubbing the Angles, *per* Foot lineal	0	0	3

III. Of Plain Horizontal Ornaments, as Frizes, &c. p. 289.

Excess in Price of 10 Bricks, *per* Foot superficial	0	0	2
Putty to *ditto*	0	0	1
Workmanship to *ditto*	0	0	10
Total	0	1	1

IV. Of gaged and rubbed straight and circular Arches, to Heads of Windows, &c. p. 290.

Excess in Price of 12 Red-Stock Bricks, *per* superficial Foot	0	0	$2\frac{1}{2}$
Putty to *ditto*	0	0	1
Workmanship to *ditto*	0	1	0
Total	0	1	$3\frac{1}{2}$

V. Of gaged and rubbed Elliptical and Gothick Arches, to Heads of Windows, &c. p. 290.

Excess in Price of 16 Red-Stock Bricks, *per* Foot superficial	0	0	$3\frac{1}{2}$
Putty to *ditto*	0	0	1
Workmanship to *ditto*	0	1	3
Total	0	1	$7\frac{1}{2}$

VI. Of plain, gaged, and rubbed Red-Stock Fascias, p. 291.

1. Of one Face.

Bricks *per* Foot superficial, N° 10.	0	0	5
Putty to *ditto*	0	0	1
Workmanship	0	0	10
Total	0	1	4

2. Of

2. Of two Faces.

Bricks *per* Foot superficial, N° 10.	0	0	5
Putty to *ditto*	0	0	1
Workmanship	0	1	0
Total	0	1	6

VII. Of gaged and rubbed Brick Fascias, enriched with a Moulding. p. 291.

Bricks *per* Foot superficial, N° 10.	0	0	5
Plain Work to *do. per* Ft. superficial	0	0	10
Mouldings *per* Ft. superficial to *do.*	0	1	4
Putty *per* Foot superficial to *ditto*	0	0	1
Total	0	2	8

VIII. Of Red-Stock horizontal square Rusticks to Doors, Quoins, Pillasters, &c. p. 292.

Bricks, N° 10, *per* Foot superficial	0	0	5
Putty to *ditto*	0	0	1
Workmanship to *ditto*	0	1	0
Total	0	1	6

IX. Of Red-Stock horizontal champher'd Rusticks to Doors, Quoins, &c.

Bricks, N° 10, *per* Foot superficial	0	0	5
Putty to *ditto* p. 293.	0	0	1
Workmanship to *ditto*, 1*st*, as a square Rustick, *per* Ft. superficial	0	1	0
And *then* extra, *per* Ft. superficial, for the Champhers	0	1	4

X. Of Red-Stock sommering Rusticks to straight and circular Arches. p. 294.

Bricks, N° 12, *per* Foot superficial	0	0	6
Putty to *ditto*	0	0	1
Workmanship to *ditto*	0	1	0
Total	0	1	7

XI. Of Red-Stock ſommering Ruſticks to Elliptical and Gothick Arches. p. 295.

Bricks, N° 16, *per* Foot ſuperficial	0	0	8
Putty to *ditto*	0	0	1
Workmanſhip to *ditto*	0	1	6
Total	0	2	3

XII. Of Red-Stock gaged and rubbed Architraves to Doors and Windows. p. 295.

1. Of ſtraight Architraves.

Bricks, N° 10, *per* Foot ſuperficial	0	0	5
Putty to *ditto*	0	0	1
Workmanſhip	0	1	4
Total	0	1	10

2. Of Circular Architraves. p 295.

Bricks, N° 12, *per* Foot ſuperficial	0	0	6
Putty to *ditto*	0	0	1
Workmanſhip to *ditto*	0	2	0
Total	0	2	7

3. Of Elliptical Architraves. p. 295.

Bricks, N° 16, *per* Foot ſuperficial	0	0	8
Putty to *ditto*	0	0	1
Workmanſhip	0	2	6
Total	0	3	3

XIII. Of plain, gaged, and rubbed Red-Stock Works, as Shafts of Pillaſters, Dados, Pannelling, *&c.* p. 297.

Bricks, N° 10, *per* Foot ſuperficial	0	0	5
Putty to *ditto*	0	0	1
Workmanſhip to *ditto*	0	0	10
Total	0	1	4

XIV. Of gaged and rubbed Red-Stock Staffs at the Angles of Pillasters, &c. and of Foot Lacings. p. 297.

Per Foot superficial	0	1	4

XV. Of Red-Stock Piers to Gates, p. 298.

I. Of plain Piers gaged and rubbed. Fig. 1. Pl. 26.

Bricks, N° 10, *per* Foot superficial	0	0	5
Putty to *ditto*	0	0	1
Workmanship to *ditto*	0	0	10
Total	0	1	4

Exclusive of the Core.

II. Of Red-Stock gaged and rubbed pannelled Piers. p. 299. Pl. 26.

Bricks, N° 10. *per* Foot superficial	0	0	5
Plain Margins to *ditto*	0	1	0
Mouldings to *ditto*	0	1	4
Plain Returns, &c. to *ditto*.	0	0	10

III. Of Grey-Stock Piers, rusticated with detached square Rusticks, rubbed and edged only, set in Mortar. p. 299. Fig. 1. Pl. 27.

1. Of the Grey-stock Work in the Shaft.

Bricks, N° 8, *per* Foot superficial	0	0	2½
Workmanship to *ditto*	0	0	5
Mortar, *per* Cube Ft. in the whole Pier	0	0	1

2. Of the Red-Stock Work in Rusticks.

Bricks, N° 8, *per* Foot superficial	0	0	4
Workmanship to *ditto*	0	0	8

Exclusive of the Core.

IV. Of Grey-Stock Piers, rusticated with detached square Rusticks, gaged and rubbed, set in Putty. Fig. 1. Pl. 27.

N. B.

N. B. The Grey-Stock Work in the Shaft and the Core is the same as in Nº III. but the Rustick Work is as follows, *viz.*

Bricks, Nº 10, *per* Foot superficial	0	0	5
Putty to *ditto*	0	0	1
Workmanship to *ditto*	0	1	0
Total	0	1	6

V. Of Red-Stock Piers rusticated with detached square Rusticks, the whole rubbed and edged only, set in Mortar.

Bricks, Nº 8, *per* Foot superficial	0	0	4
Mortar, *per* Cube Foot, in the whole Pier	0	0	1
Workmanship to *ditto*	0	0	8

Exclusive of the Core.

VI. Of Red-stock Piers, rusticated with detached square Rusticks, gaged and rubbed, and set in Putty.

Bricks, Nº 10, *per* superficial Foot	0	0	5
Putty to *ditto*	0	0	1
Workmanship to *ditto*	0	1	0
Total	0	1	6

Exclusive of the Core.

VII. Of Red-stock Piers, rusticated with champhered Rusticks, the whole rubbed and edged only, set in Mortar.

Bricks, Nº 8, *per* superficial Foot	0	0	4
Mortar, *per* Cube Foot, in the whole Pier	0	0	1
Workmanship to *ditto*, exclusive of the Champhers	0	0	8

Cham-

Champhers cut *per* Foot superficial extra	0	1	4

Exclusive of the Core.

VIII. Of Red-stock Piers, rusticated with detached champhered Rusticks, the whole gaged and rubbed, and set in Putty. Fig. 2. Pl. 27.

Bricks, N° 10, *per* Foot superficial	0	0	5
Putty to *ditto*	0	0	1
Workmanship to *ditto*, exclusive of the Champhers	0	1	0
Champhers cut *per* Foot superficial	0	1	4

Exclusive of the Core.

IX. Of Red-Stock Piers, rusticated with Rabbit Rusticks, rubbed and edged only. Fig. 1. Pl. 28.

Bricks, N° 8, *per* Foot superficial	0	0	4
Workmanship to *ditto*	0	0	8
Mortar, *per* Cube Foot, in the whole Pier	0	0	1

Exclusive of the Core.

X. Of Red-stock Piers, rusticated with champher'd Rusticks, rubbed and edged only, set in Mortar. Fig. 2. Plate 28.

Bricks, N° 10, *per* Foot superficial	0	0	5
Mortar to the whole Pier, *per* Cube Foot	0	0	1
Workmanship to *ditto*, exclusive of the Champhers	0	0	8
Champhers, *per* Foot superficial	0	1	4

Exclusive of the Core.

XI. Of Red-stock Piers, rusticated with champher'd Rusticks, gaged and rubbed, and set in Putty. Fig. 2. Plate 28.

Bricks, N° 10, *per* Foot superficial	0	0	5
Putty to *ditto*	0	0	1

Workmanſhip to *ditto*	0	1	4

Excluſive of the Champhers.

Champhers *per* Foot ſuperficial extra	0	1	4

Excluſive of the Core.

XII. Of Red-ſtock octangular, *&c.* Piers, plain or ruſticated. Fig. 1. Pl. 29.

N. B. The Prices of Materials and of Workmanſhip of octangular Piers is the ſame as of the ſame kind of ſquare Piers, excepting the extra Work of Four Pence Half-penny *per* lineal Foot, for cutting their obtuſe Angles, which muſt always be added.

XIII. Of Red-ſtock circular Piers, gaged and rubbed, ſet in Putty, plain or ruſticated, as Fig. 2. Plate 29.

Bricks, N° 16, *per* Foot ſuperficial	0	0	8
Putty to *ditto*	0	0	1
Workmanſhip to *ditto*	0	2	0
Total	0	2	9

Excluſive of the Core.

N. B. That the Core of a Pier, *&c.* is thus valued.

Bricks *per* Cube Foot	0	0	3
Mortar to *ditto*	0	0	1
Workmanſhip	0	0	1½
Workmanſhip and Bricks	0	0	5½
Workmanſhip and Mortar	0	0	2½
Work, Bricks, and Mortar	0	0	5½

XVI. Of Circular and Elliptical Niches, gaged and rubbed, ſet in Putty.

Firſt, Of Circular Niches. p. 300.

1ſt,

1*st*, Of the Body.

Bricks, Nº 10, *per* superficial Foot	0	0	5
Putty to *ditto*	0	0	1
Workmanship to *ditto*	0	2	0

2*dly*, Of the Head.

Bricks, Nº 12, *per* superficial Foot	0	0	6
Putty to *ditto*	0	0	1
Workmanship to *ditto*,	0	4	0

Exclusive of the common Work in the Back, *&c.*

Secondly, Of Elliptical Niches. p. 300.

1*st*, Of the Body.

Bricks, Nº 10, *per* superficial Foot to the Body	0	0	5
Putty to *ditto*	0	0	1
Workmanship to *ditto*	0	2	6

2*dly*, Of the Head.

Bricks, Nº 16, *per* superficial Foot	0	0	8
Putty to *ditto*	0	0	1
Workmanship to *ditto*	0	6	0

Exclusive of the common Work in the Back, which must be reckoned *per* Cube Foot, as the Core of a Pier.

XVII. Of Pillasters to Arcades.

N. B. The Value of Pillasters, both plain and rusticated, is in all Respects the same as of plain and rusticated Piers to Gates, *&c.* contained in the XVth, *&c.* hereof, p. 354.

XVIII. Of Circular Impost, *&c.* Mouldings.

Per superficial Foot	0	2	8

SECT. XX. *Of new Plain Tiling.*

1*st*, Of a six Inch Gage.

Prime Cost *per* Square	1	4	$5\frac{1}{2}$

Ditto,

Ditto, with the allowed Profits	1	8	2¼
Tiles *per* Square, N° 768.			

2*dly*, Of a seven Inch Gage.

Prime Cost *per* Square	1	1	6
Ditto, with the preceding Profits	1	4	8½
Tiles *per* Square, N° 655.			

3*dly*, Of an eight Inch Gage.

Prime Cost *per* Square	0	19	4
Ditto, with the preceding Profits	1	2	4
Tiles *per* Square, N° 576.			

Sect. XXI. *Of new Pan Tiling, laid to a ten Inch Gage.*

Prime Cost *per* Square laid dry	0	14	6
Ditto, with the preceding Profits	0	16	1½
Ditto, *per* Square, when laid in Lime and Hair and pointed	1	0	1½
Workmanship *per* Square, laid dry	0	1	6
Ditto, laid in Lime and Hair	0	3	6
Lime and Hair *per* Square	0	2	0
Tiles *per* Square, N° 180.			

N. B. Glazed Ridge and Pan Tiles are double the Price of unglazed, *viz.* 12 *s.* *per* Hundred.

Sect. XXII. *Of Brick Pavements.*

1*st*, Of Grey-stock Bricks laid flat.

Prime Cost *per* superficial Yard	0	0	11
Ditto, with allowed Profits	0	1	0¾
Bricks N° 36 *per* Yard.			

2*dly*,

2dly, Of Grey-ſtock Bricks laid on their Edges.

Prime Coſt *per* ſuperficial Yard	0	1	6
Ditto, with the allowed Profits	0	1	9½

Bricks Nº 66 *per* Yard.

3dly, Of Paving Bricks laid flat.

Prime Coſt *per* Yard	0	1	2
Ditto, with Profits aforeſaid	0	1	4½

Bricks Nº 32 *per* Yard.

4thly, Of Paving Bricks laid on their Edges.

Prime Coſt *per* Yard	0	3	1
Ditto, with Profits aforeſaid	0	3	6½

Bricks Nº 82 *per* Yard.

SECT. XXIII. *Of Tile Pavements.*

1ſt, Of Ten Inch Tiles.

Prime Coſt *per* Yard	0	1	8
Ditto, with the aforeſaid Profits	0	2	0
Ditto, laid in Brick-duſt Mortar	0	2	1
And when laid in Terrace Mortar	0	2	8

2dly, Of Foot Tiles.

Prime Coſt *per* Yard	0	2	6
Ditto, with the aforeſaid Profits	0	2	10
Do. when laid in Brick-duſt Mortar	0	3	0
And when laid in Terrace	0	3	7

SECT. XXIV. *Of* Dutch *Chimney Tiles, commonly called Gally Tiles.*

1ſt, Of white Tiles.

Prime Coſt *per* Tile	0	0	2
Ditto, with 25 *per Cent.* Profit	0	0	2½

2dly, Of marbled Tiles.

Prime Coſt *per* Tile	0	0	3

Ditto,

Ditto, with 25 *per Cent.* Profit	o	o	$3\frac{1}{4}$
3dly, Of the best painted Tiles.			
Prime Cost *per* Tile	o	o	4
Ditto, with 25 *per Cent.* Profit	o	o	5
4thly, Of the 2*d* best painted Tiles.			
Prime Cost *per* Tile	o	o	$3\frac{1}{2}$
Ditto, with 25 *per Cent.* Profit	o	o	$3\frac{1}{8}$
Squaring and setting, *per* Tile, Plaister included	o	o	1
Old Tiles taken down and re-set, *per* Tile, Plaister included	o	o	$0\frac{3}{4}$
Old Tiles already taken down, and new set, *per* Tile, Plaister included	o	o	$0\frac{1}{2}$

Sect. XXV. *Of Shafts to Chimneys.*

Per Foot superficial, for Outsides and Widths	o	o	$5\frac{1}{8}$
Viz. Bricks, N° $5\frac{1}{3}$	o	o	$1\frac{1}{2}$
Mortar	o	o	$0\frac{3}{8}$
Workmanship	o	o	4
The whole allowed at	o	o	6

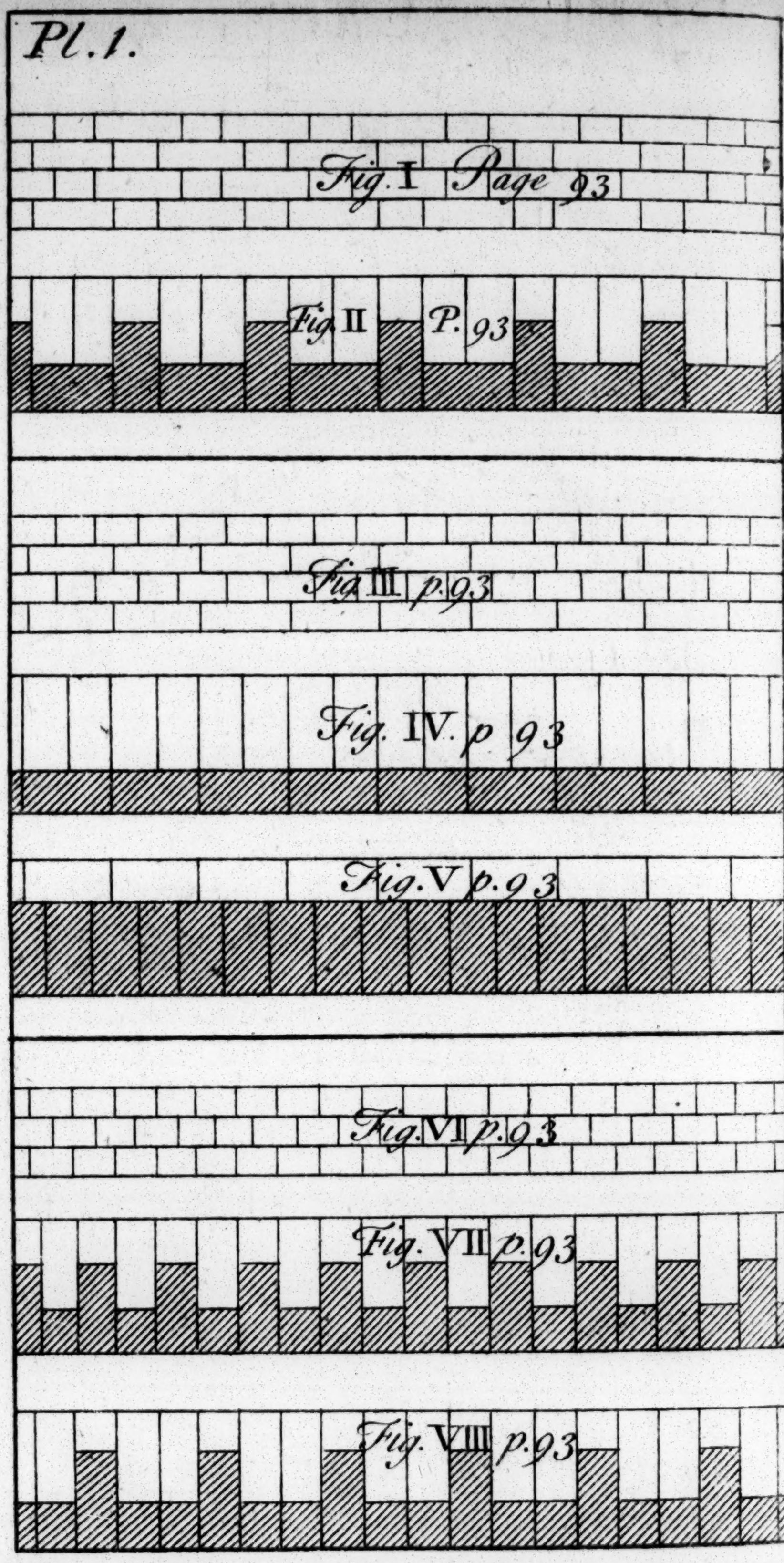
Sect. XXVI. *Of Flouting and new Fronting the Fronts of old Houses.*

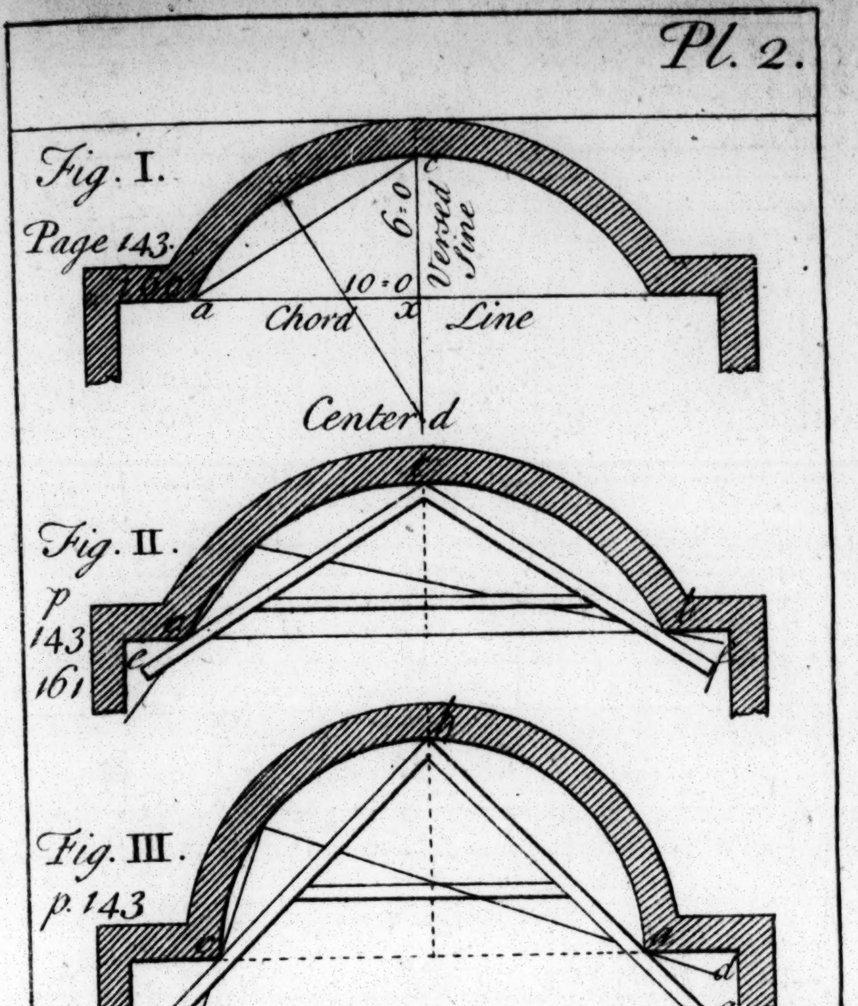
Per Foot superficial Exclusive of Scaffolding.	o	o	3

Sect. XXVII. *Of the Repairs of Plain and Pan Tiling.*

Vide for Plain Tiling, Page 329.
And for Pan Tiling, Page 331.

F I N I S.


Pl. 1.
Fig. I Page 93
Fig. II P. 93
Fig. III p. 93
Fig. IV. p 93
Fig. V p. 93
Fig. VI p. 93
Fig. VII p. 93
Fig. VIII p. 93


Pl. 2.
Fig. I.
Page 143.
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10:0
Chord Line
Center d
Fig. II.
p 143 161
Fig. III.
p. 143
Templet
Templet
Fig. IV
p 143

Pl. 3

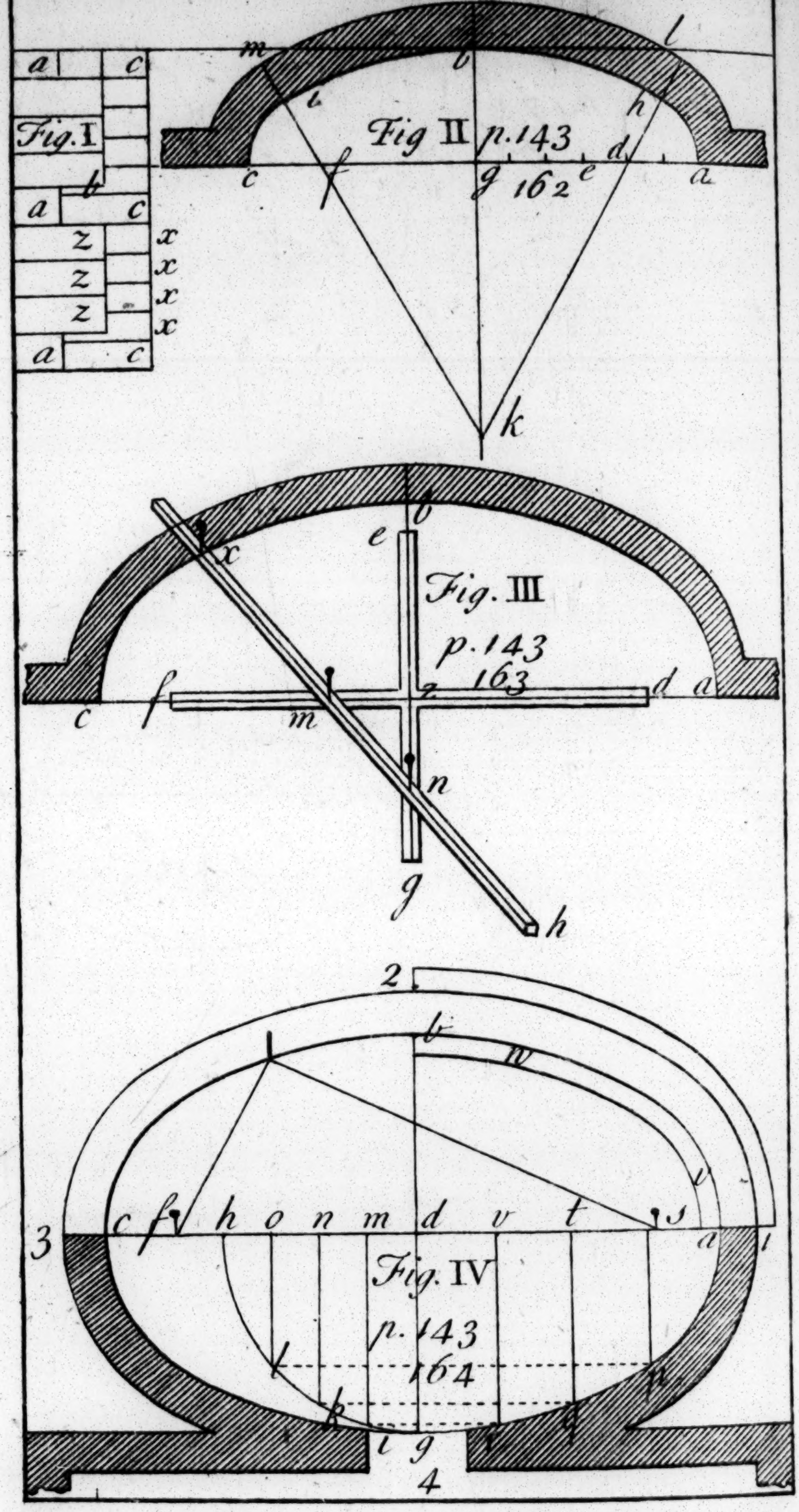
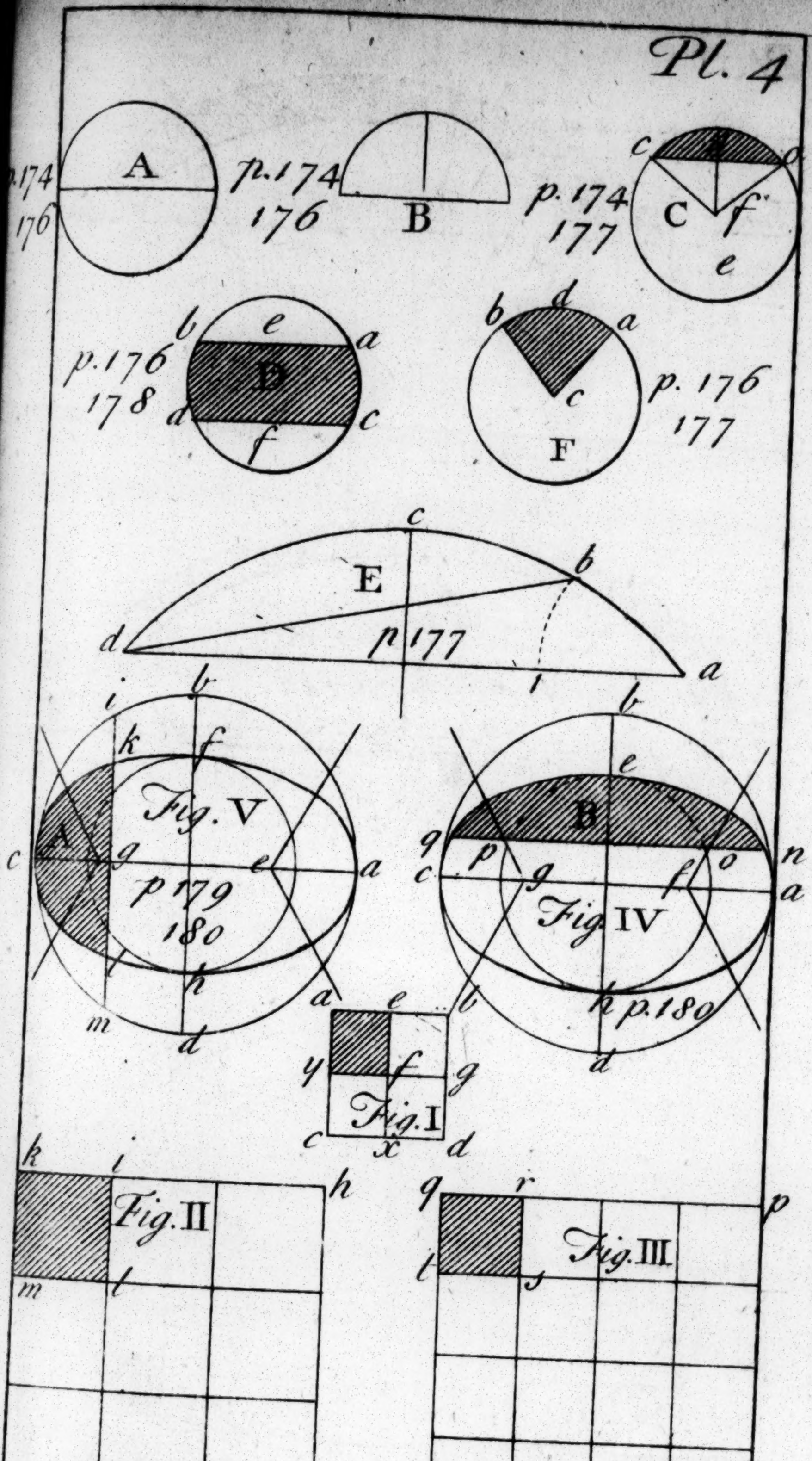
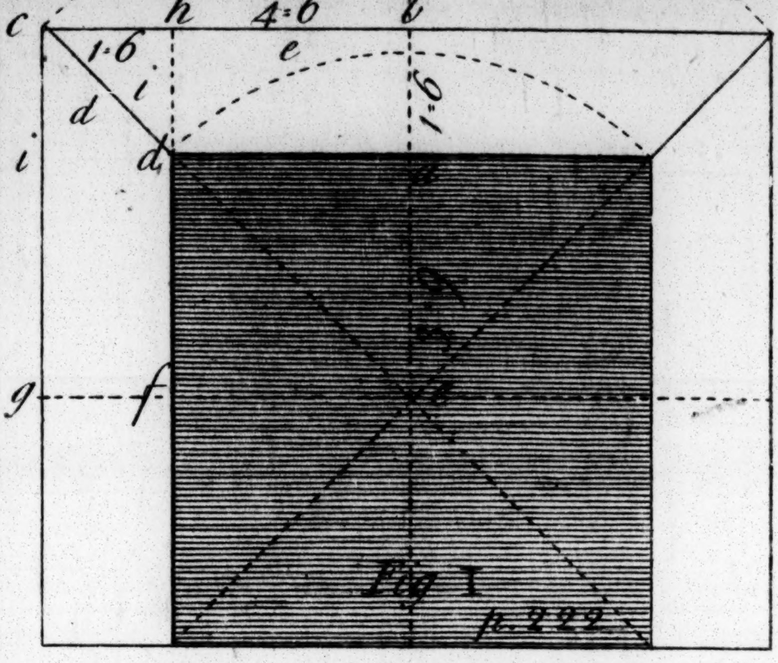


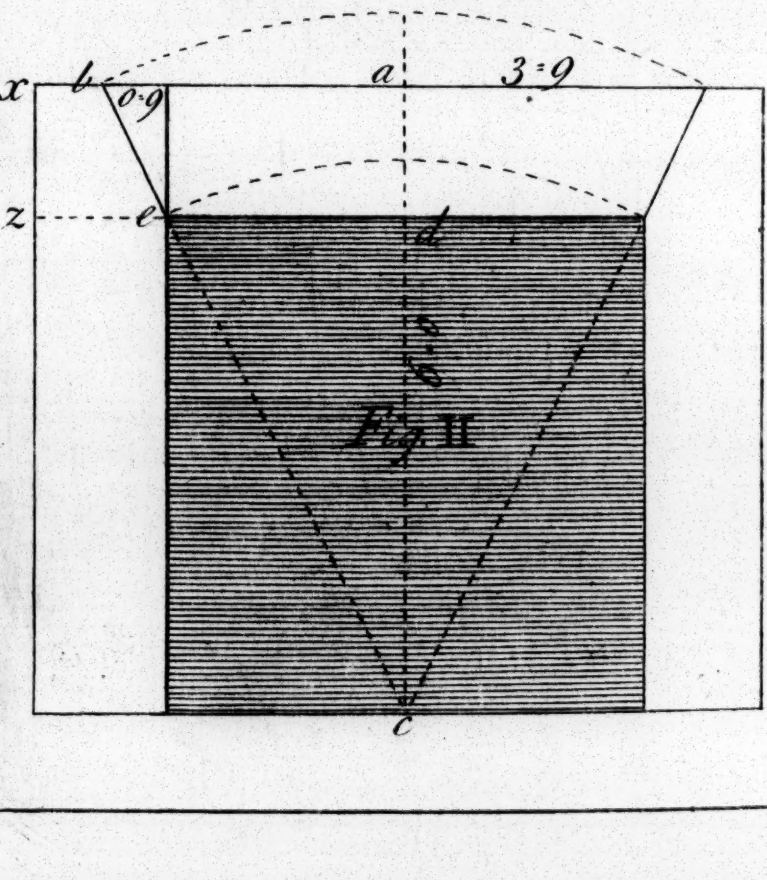
Fig. I
a c b a c z x z x z x x a c
Fig II p.143 162
m b l i h c f g e d a k
Fig. III p.143 163
b e x c f m d a n g h
2 b w v
3 c f h o n m d v t s a 1
Fig. IV p.143 164
l p k q i g r 4

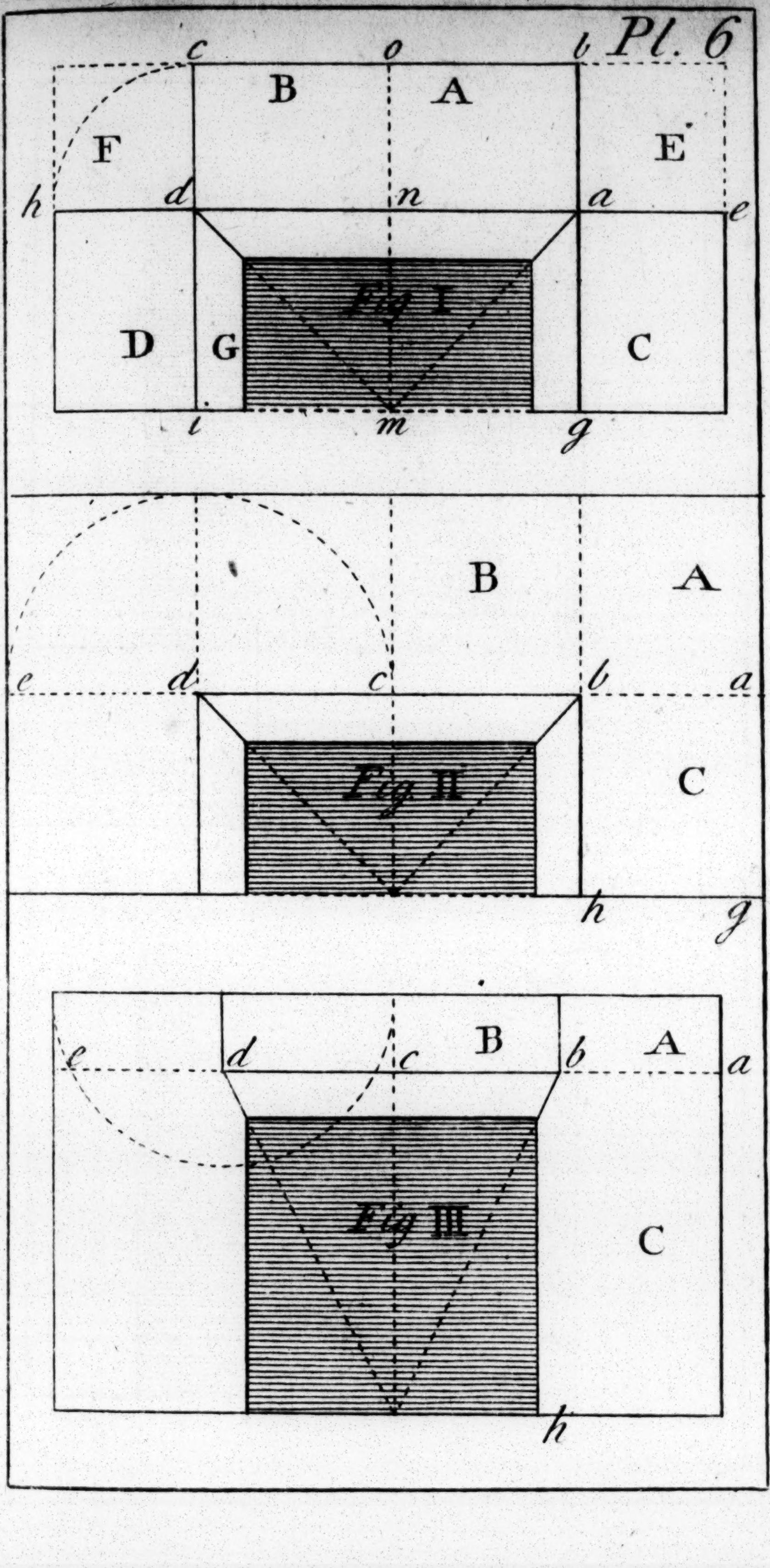


Pl. 4
A
p.174
176
B
p.174
176
C
p.174
177
D
p.176
178
F
p.176
177
E
p 177
Fig. V
p 179
180
B
Fig. IV
p.180
Fig. I
Fig. II
Fig. III

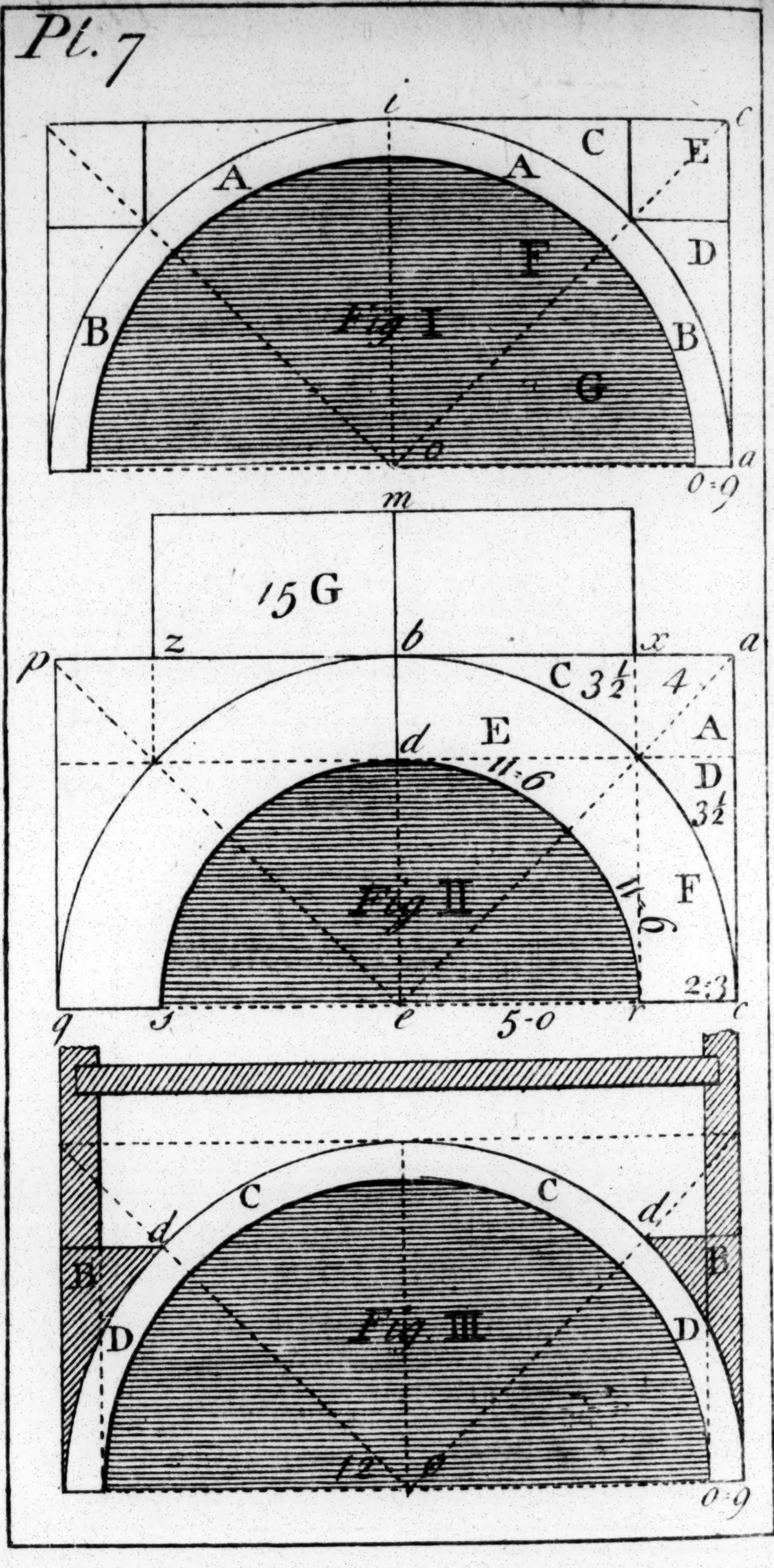
Pl. 5






Pl. 6
c o b
B A
F E
h d n a e
D G Fig I C
i m g
B A
e d c b a
Fig II C
h g
e d c B b A a
Fig III C
h

Pl. 7



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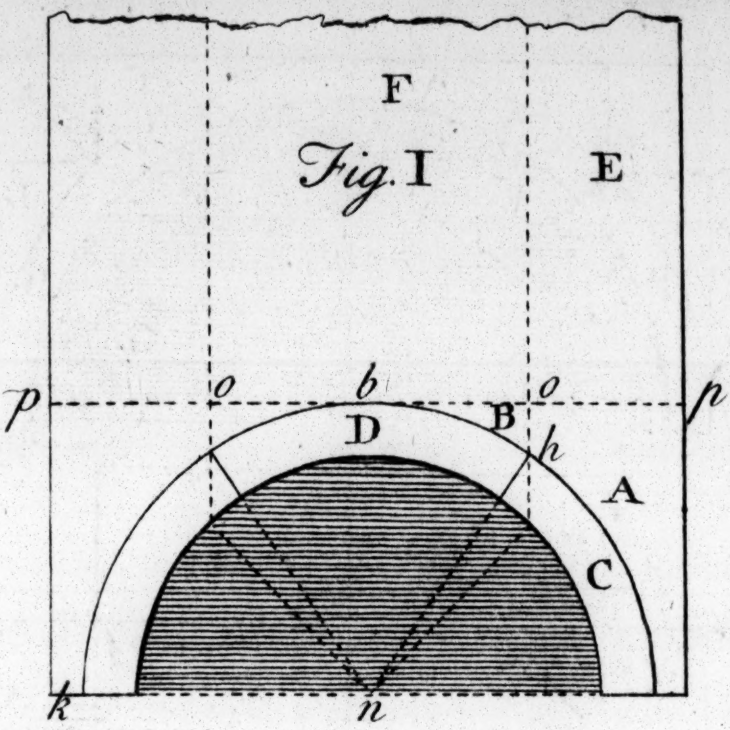


Fig. I

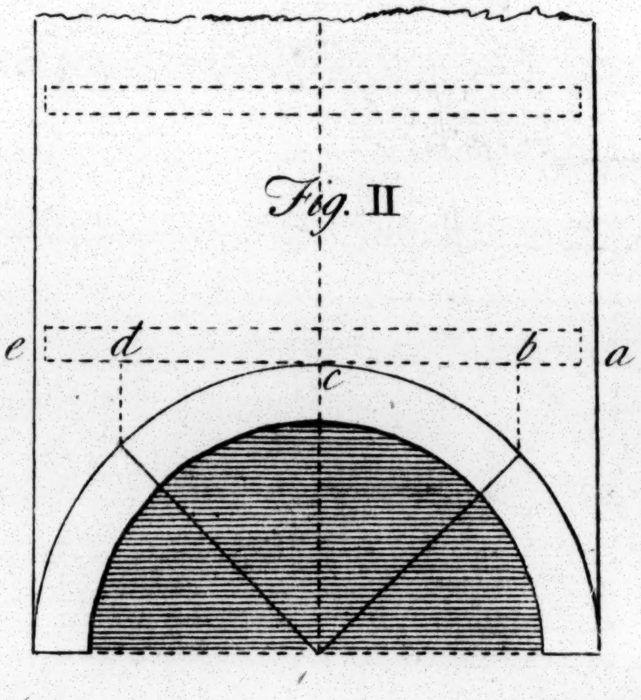
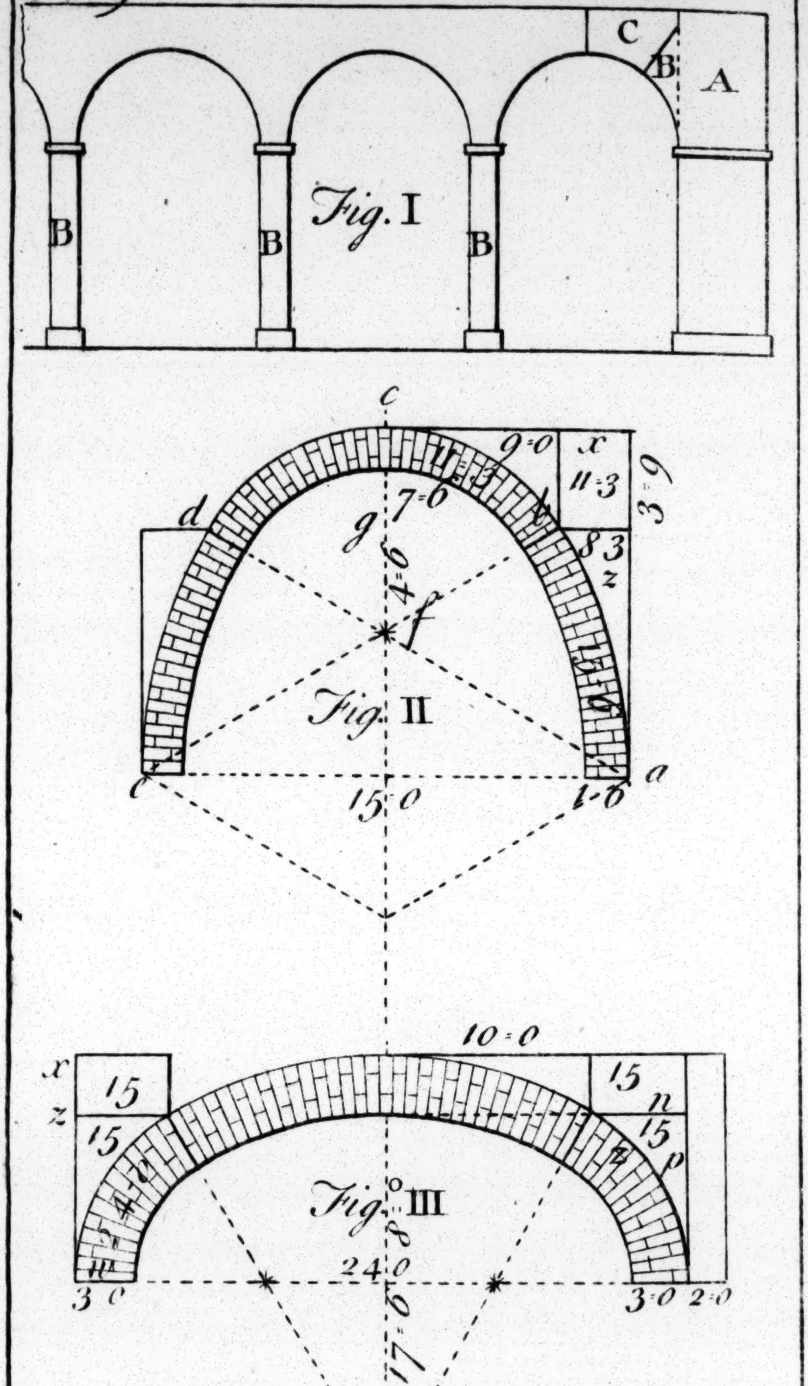
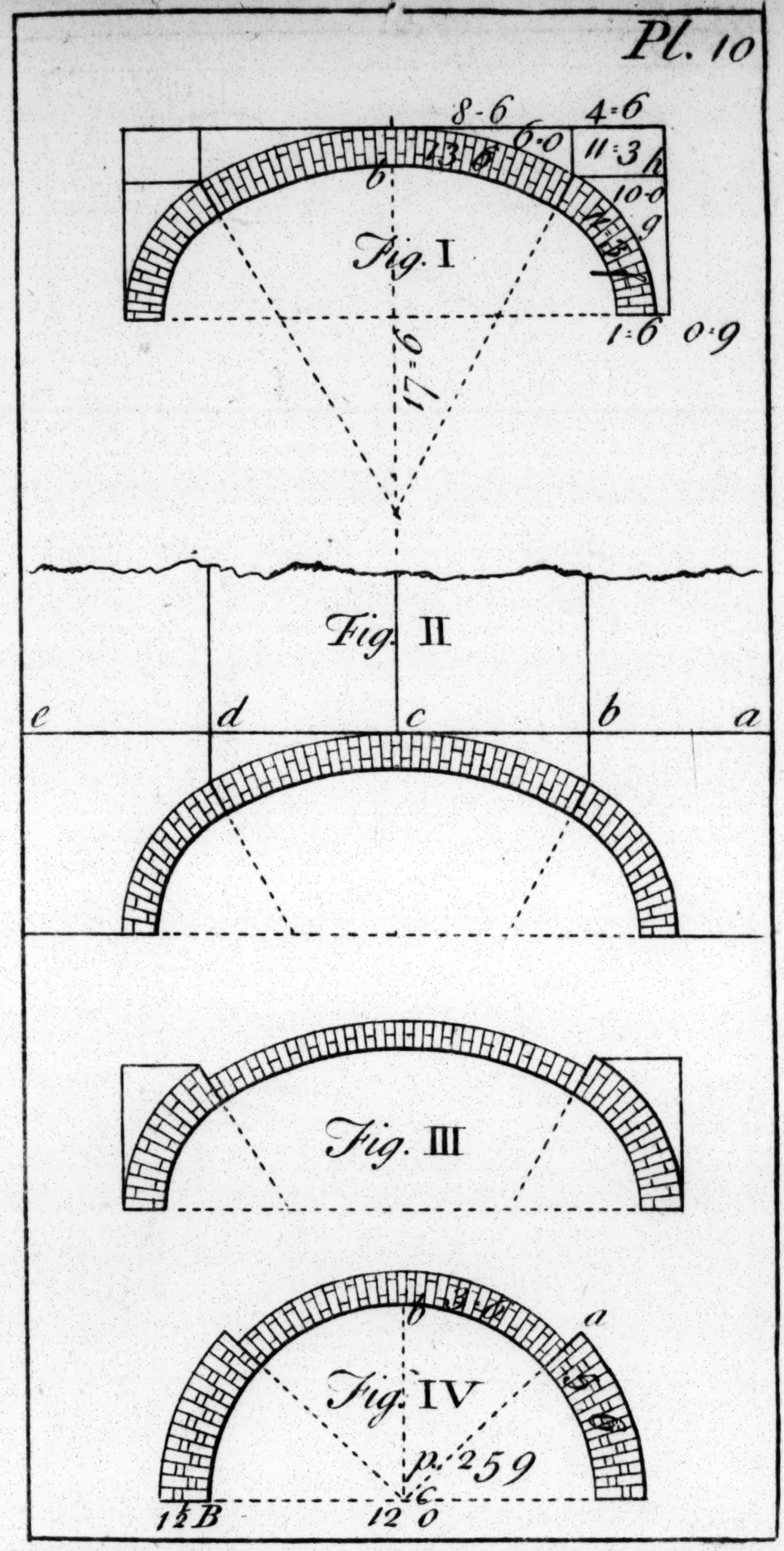


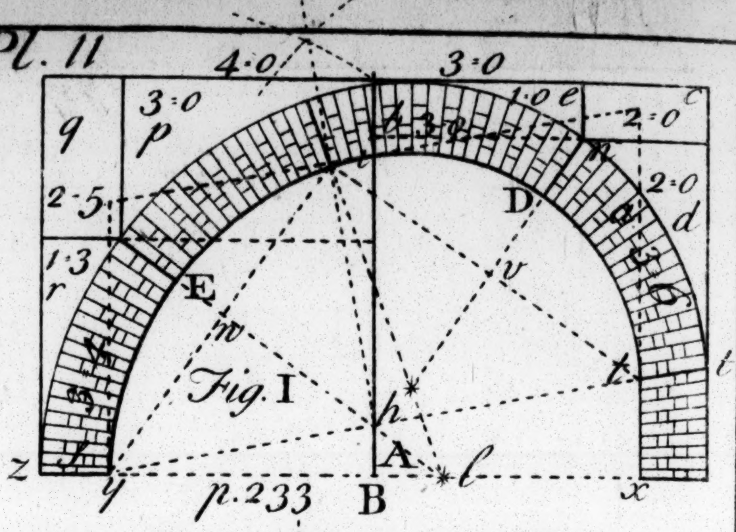
Fig. II

Pl. 9




Pl. 10
8·6
4·6
6·0
11·3
13·6
h
10·0
g
b
Fig. I
1·6
0·9
17·6
Fig. II
e
d
c
b
a
Fig. III
b
a
Fig. IV
p. 259
1½ B
12
c
0

Pl. 11



p. 233

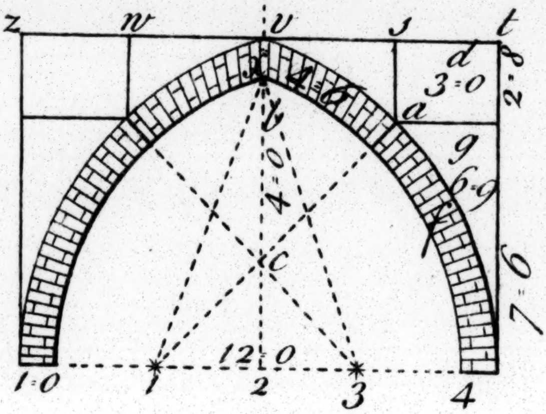


Fig. II

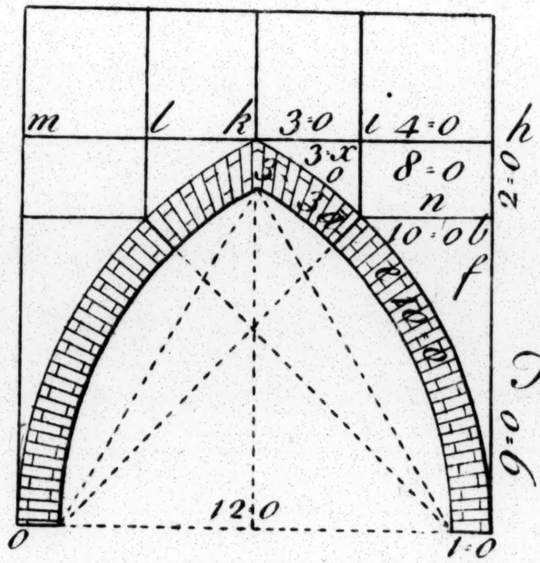
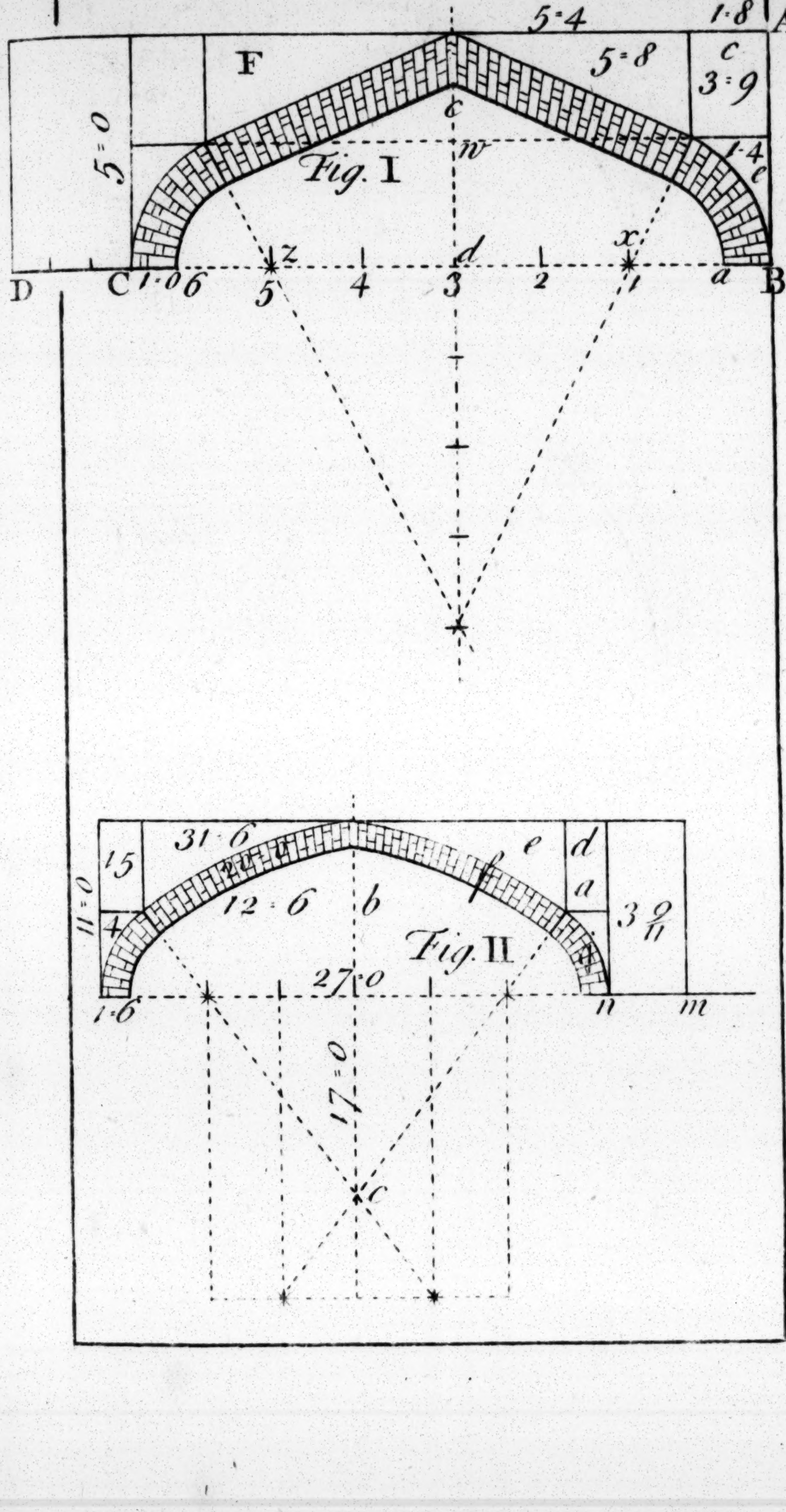
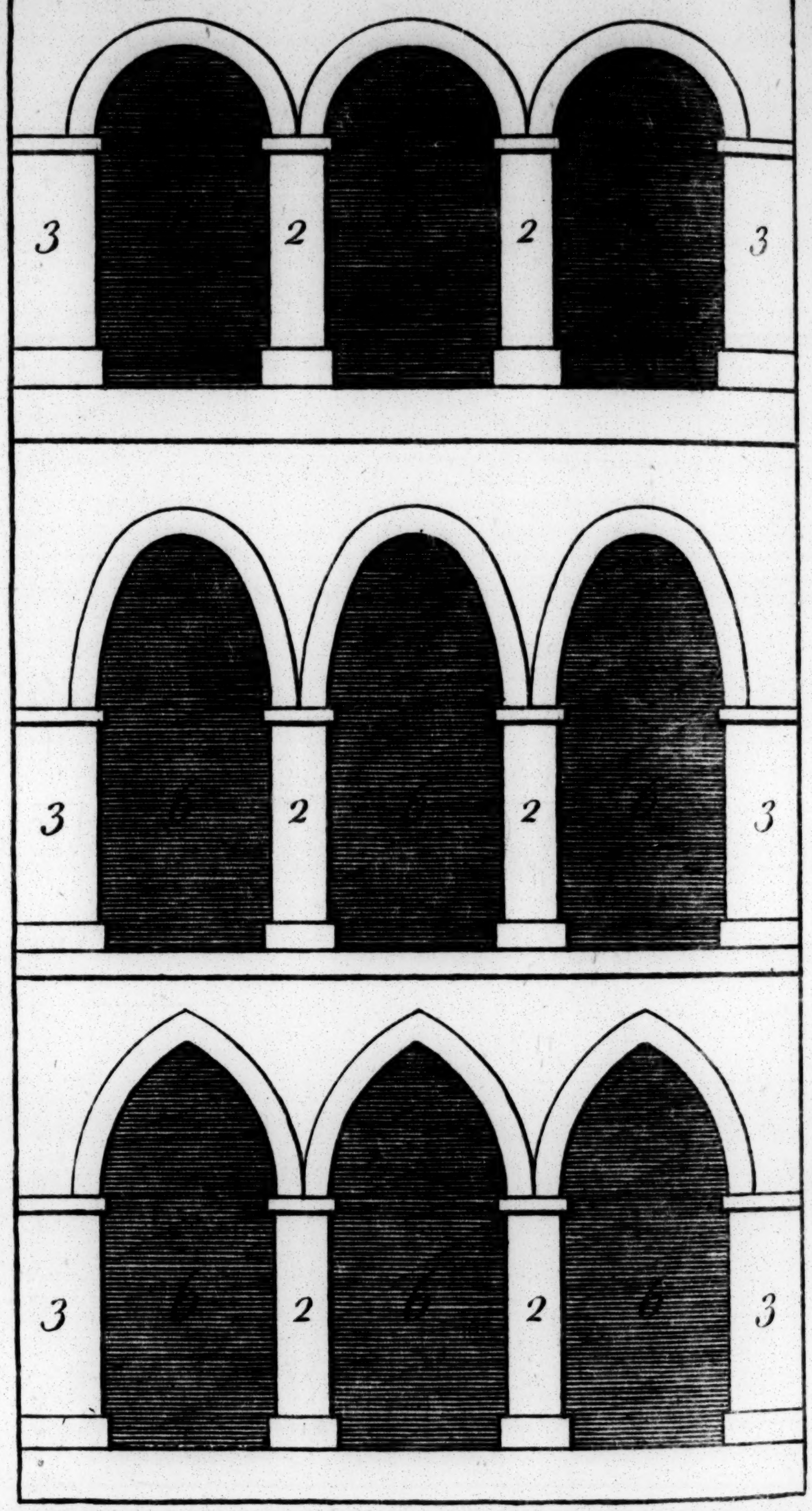


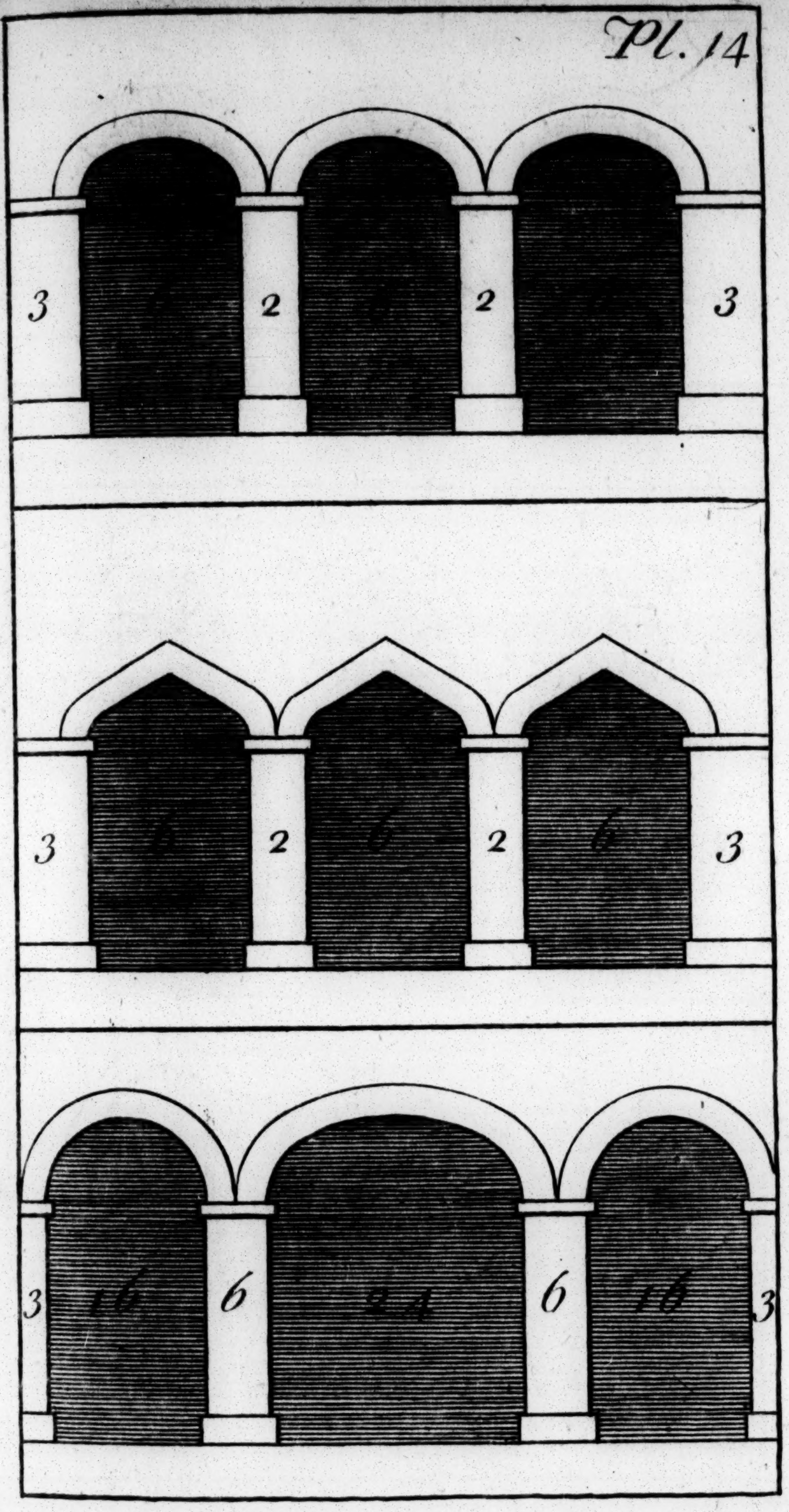
Fig. III


5·4
1·8
A
F
5·8
c
3·9
5·0
c
w
1·4
e
Fig. I
z
d
x
D
C
1·0
6
5
4
3
2
1
a
B
31·6
20·0
15
d
e
a
11·0
4
12·6
b
3 9/11
Fig. II
27·0
1·6
n
m
17·0
c

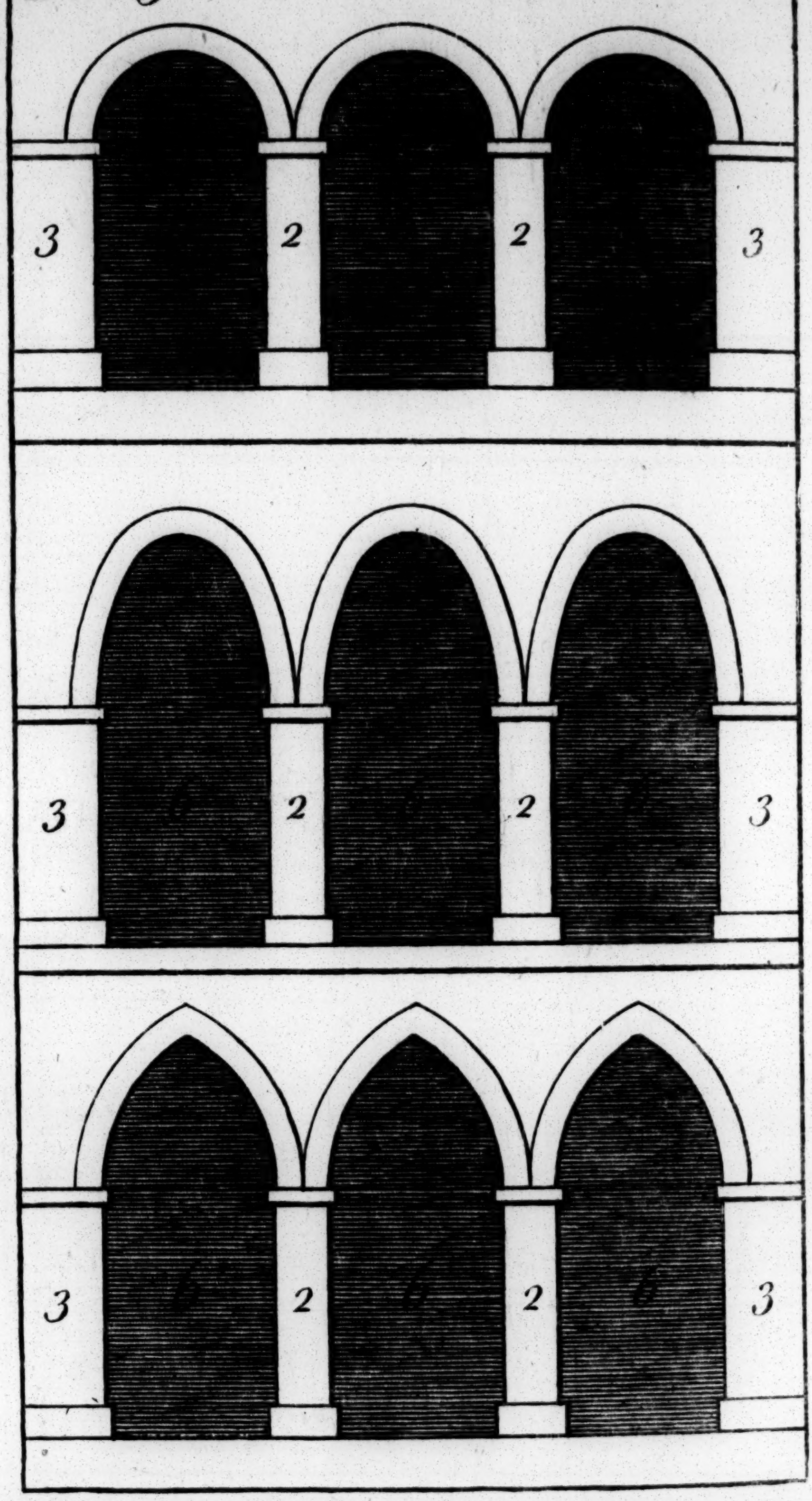
Pl. 13



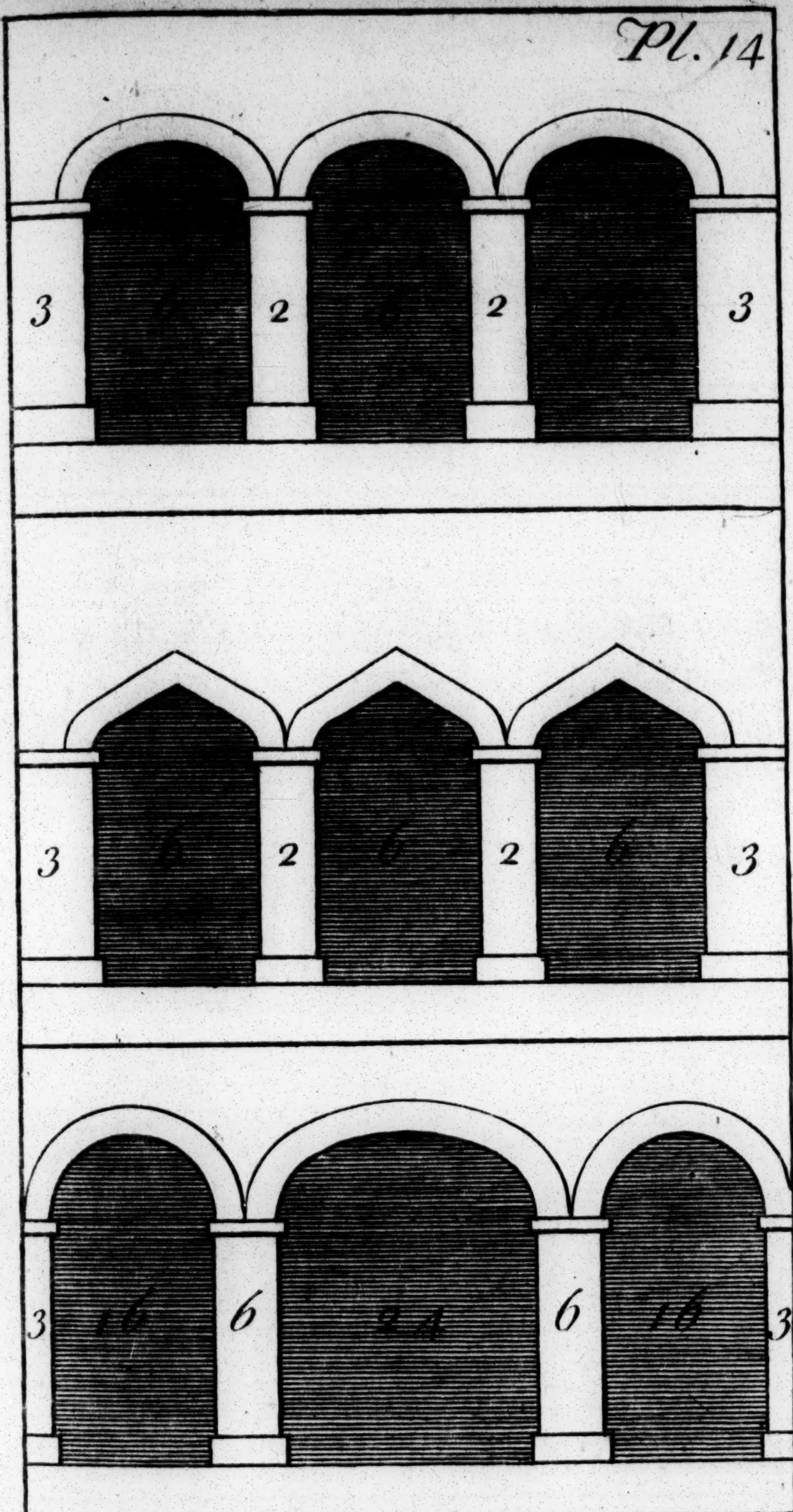
Pl. 14

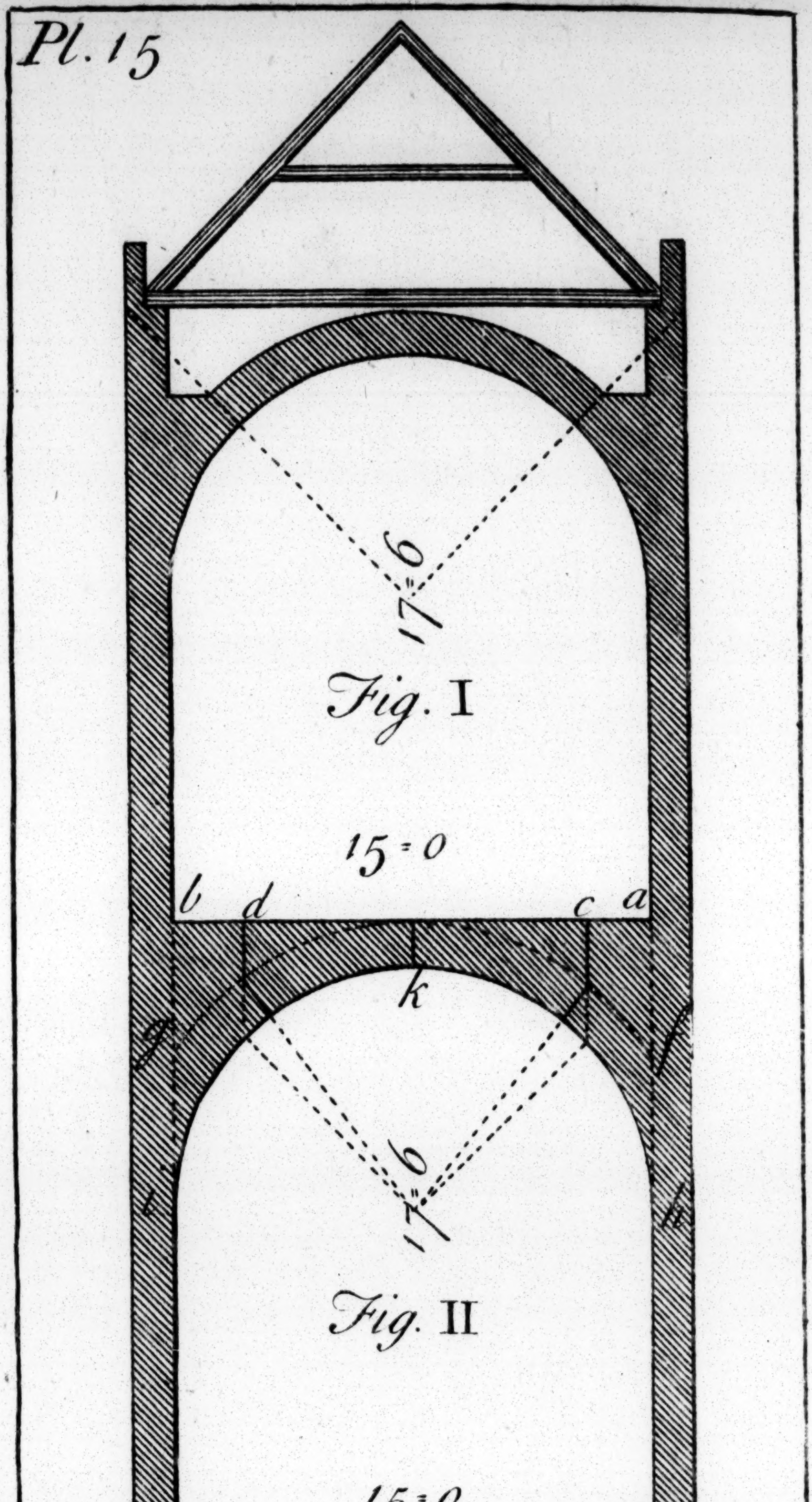


Pl. 13



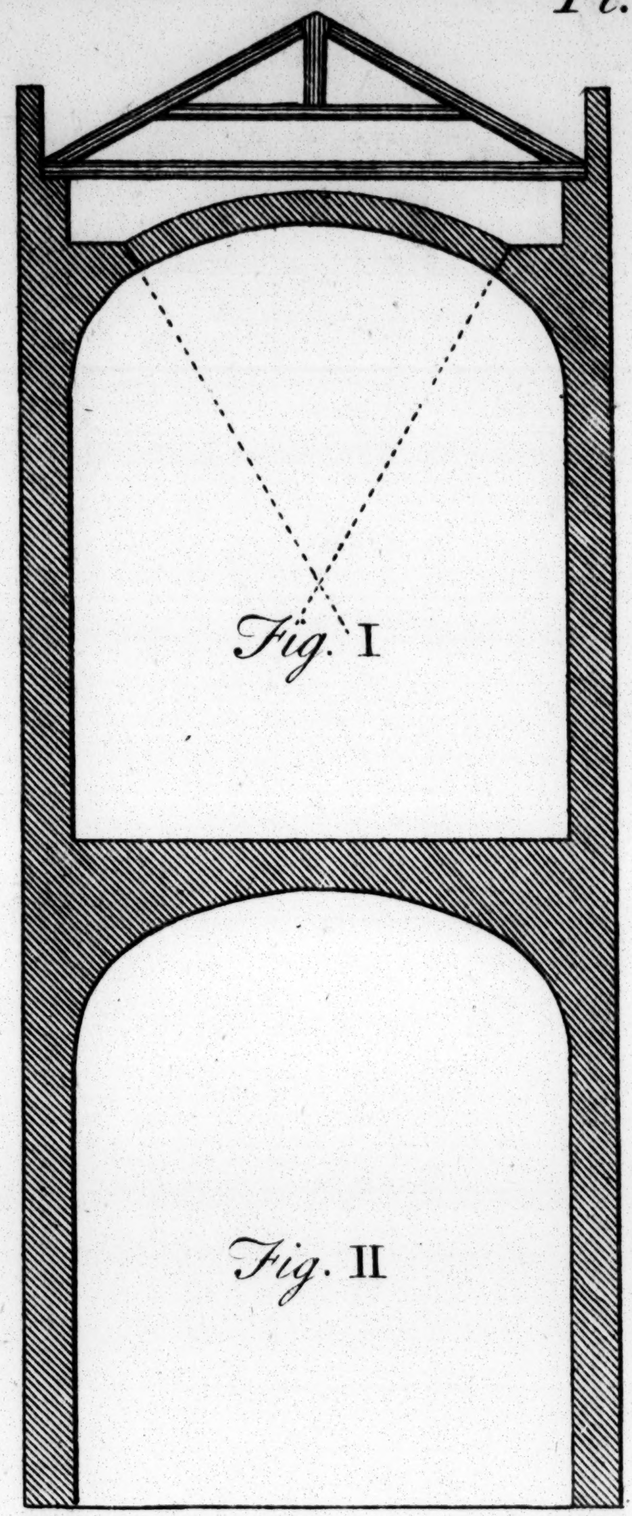
Pl. 14



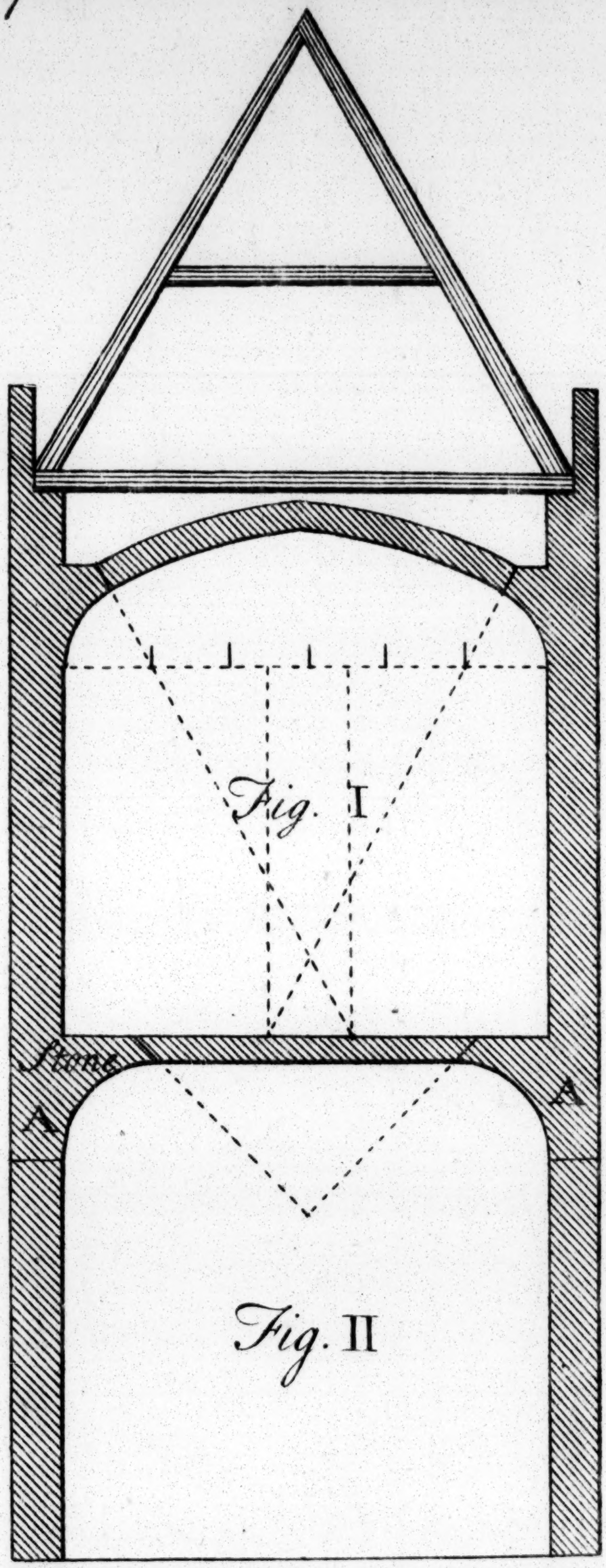


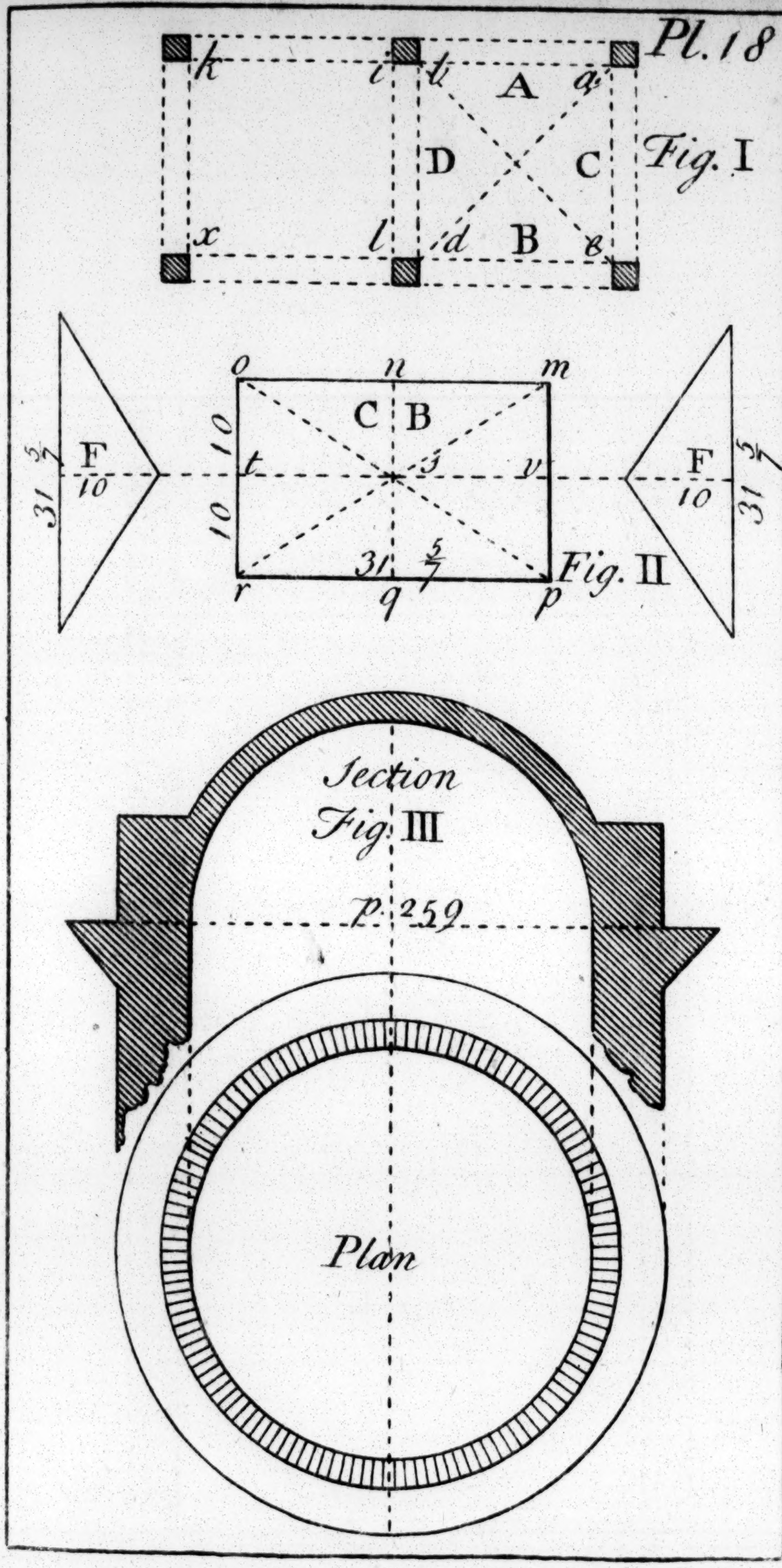
Pl. 15
17=6
Fig. I
15=0
b
d
c
a
k
g
f
i
h
17=6
Fig. II
15=0
1-6

Pl. 16



Pl. 17





Pl. 18
Fig. I
k
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l
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e
Fig. II
o
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t
3
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r
q
p
Section
Fig. III
p. 259
Plan

Pl. 19

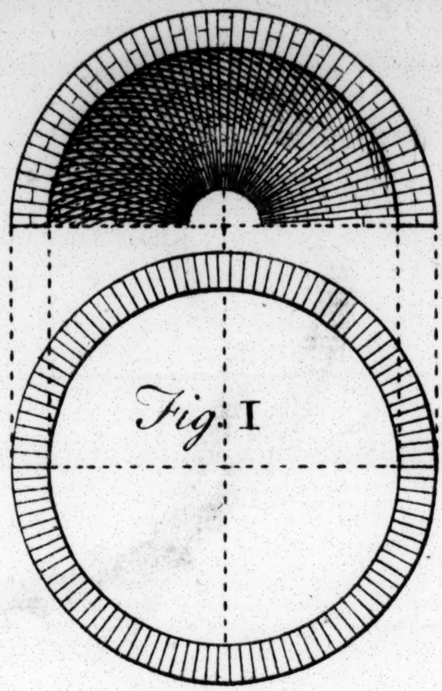


Fig. I

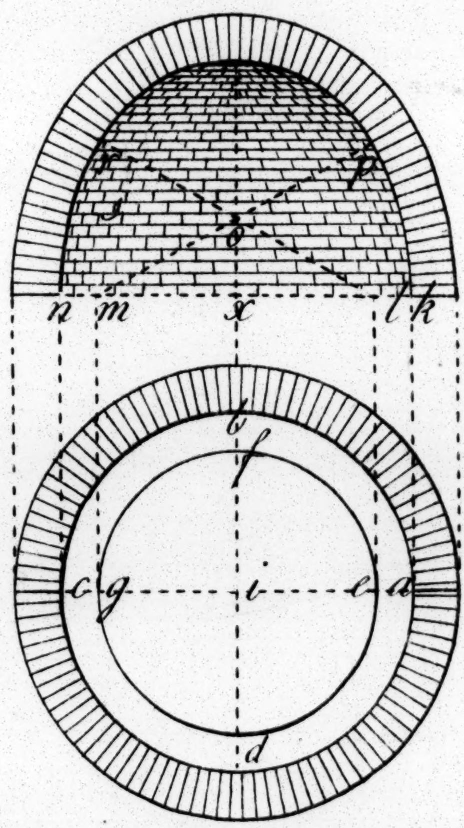
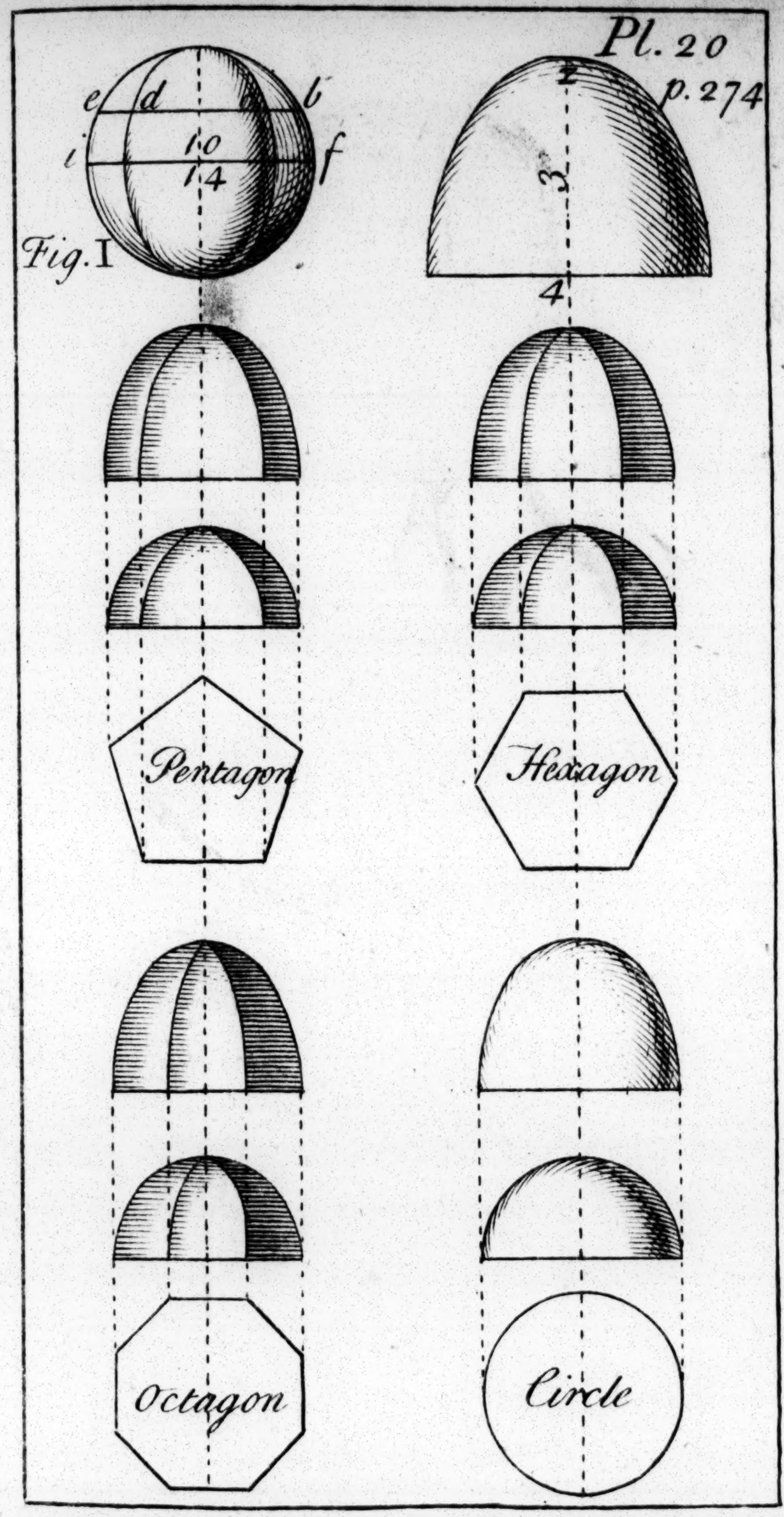


Fig. II



Pl. 20
p. 274
Fig. I
e
d
b
i
f
10
14
2
3
4
Pentagon
Hexagon
Octagon
Circle

Pl. 19

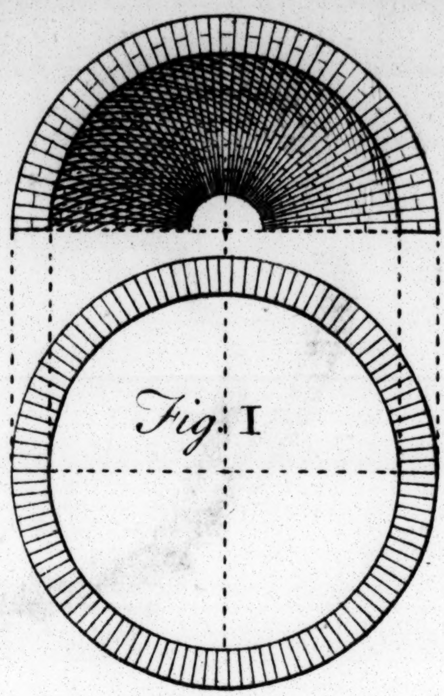


Fig. I

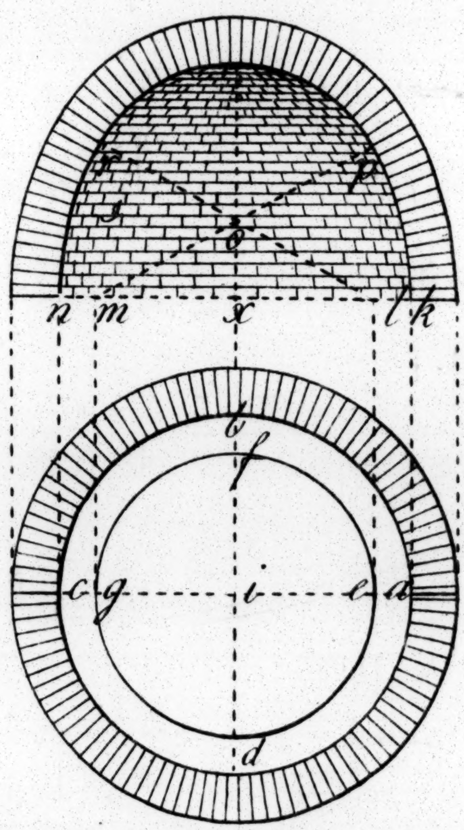
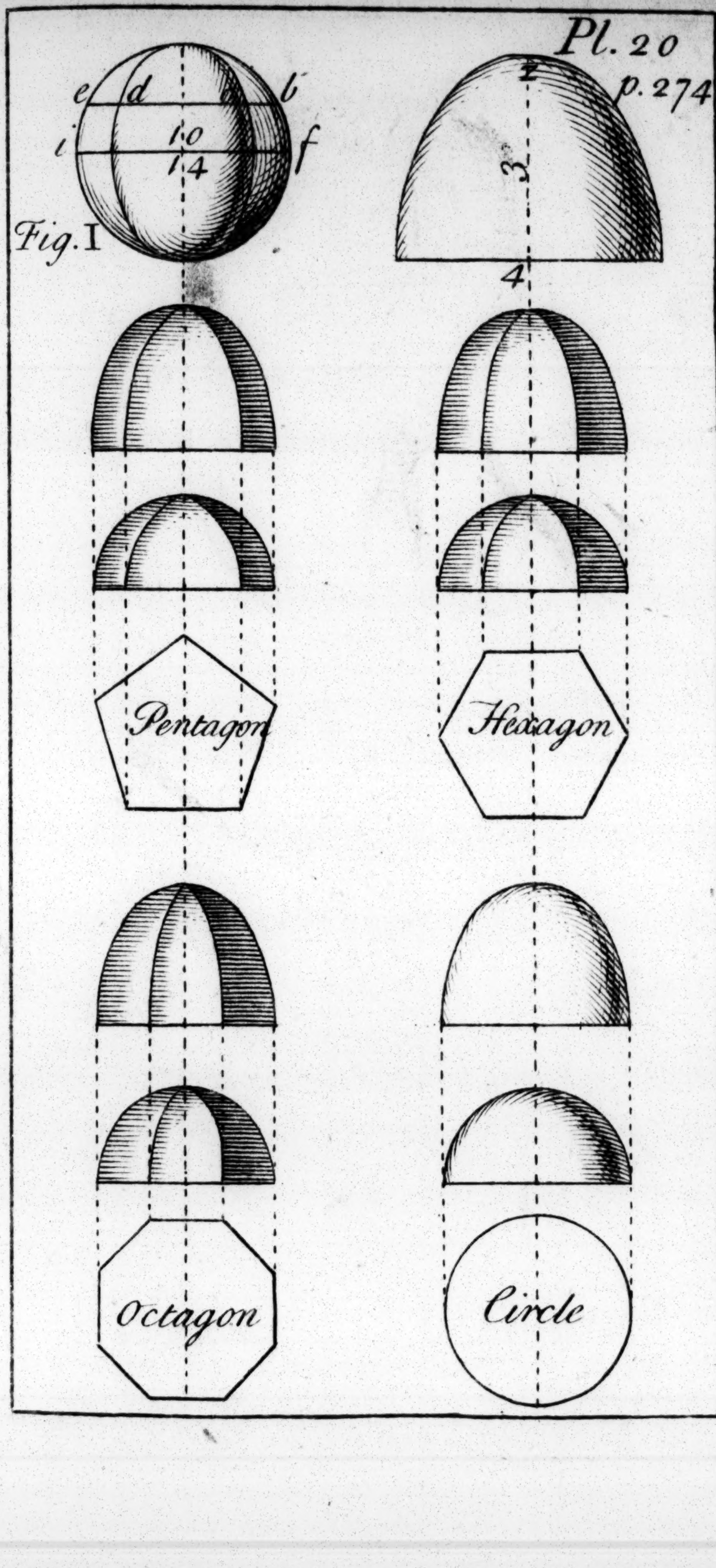
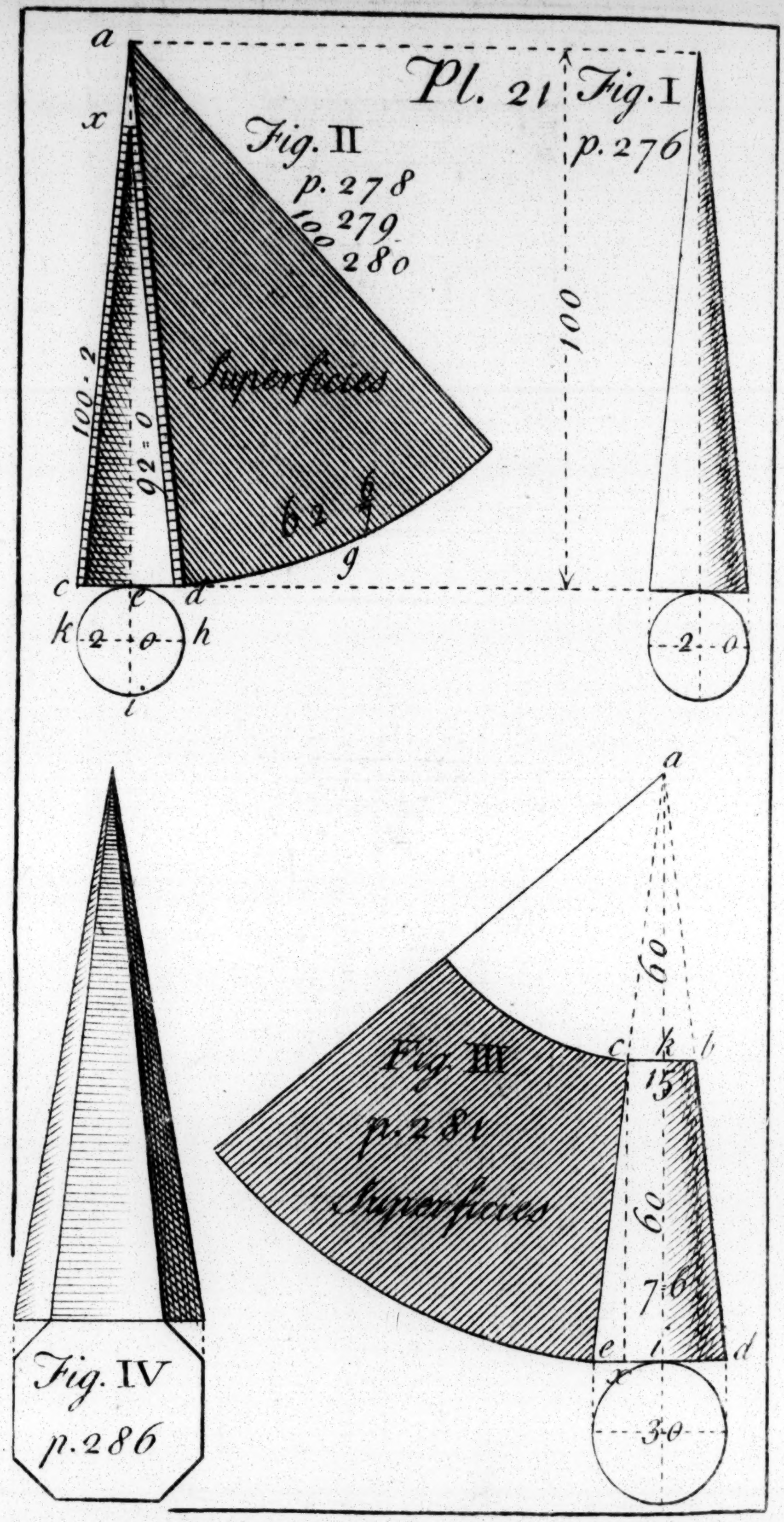


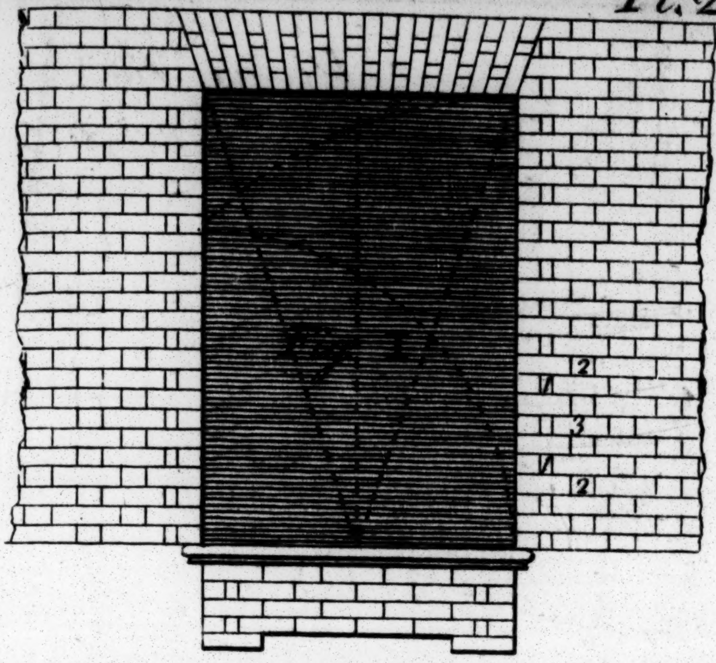
Fig. II

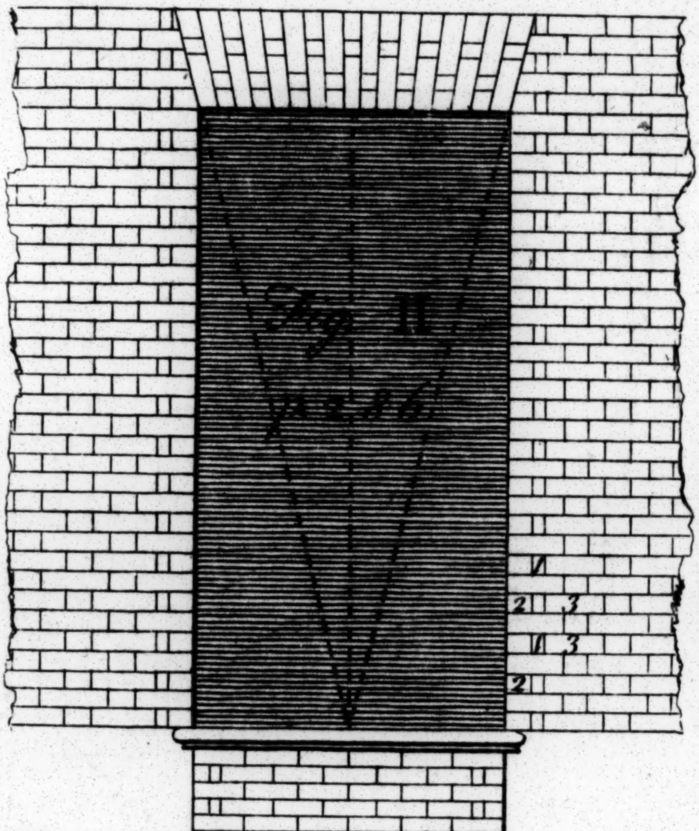

Pl. 20
p. 274
Fig. I
e
d
b
i
f
10
14
2
3
4
Pentagon
Hexagon
Octagon
Circle

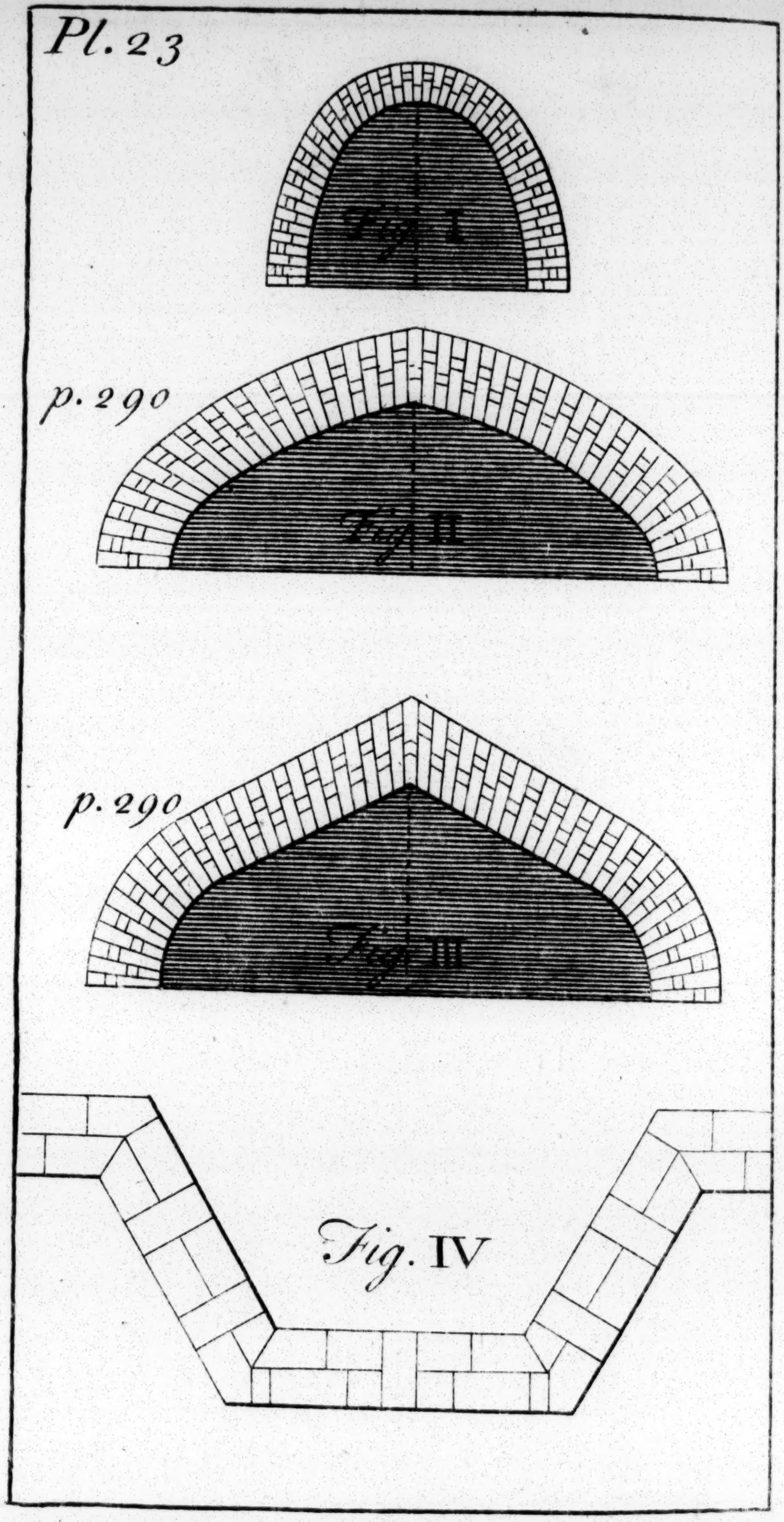


Pl. 21
Fig. I
p. 276
Fig. II
p. 278
279
280
100
Superficies
100·2
92·0
62
a
x
c
e
d
k
h
i
2
0
Fig. III
p. 281
Superficies
60
15
76
30
Fig. IV
p. 286

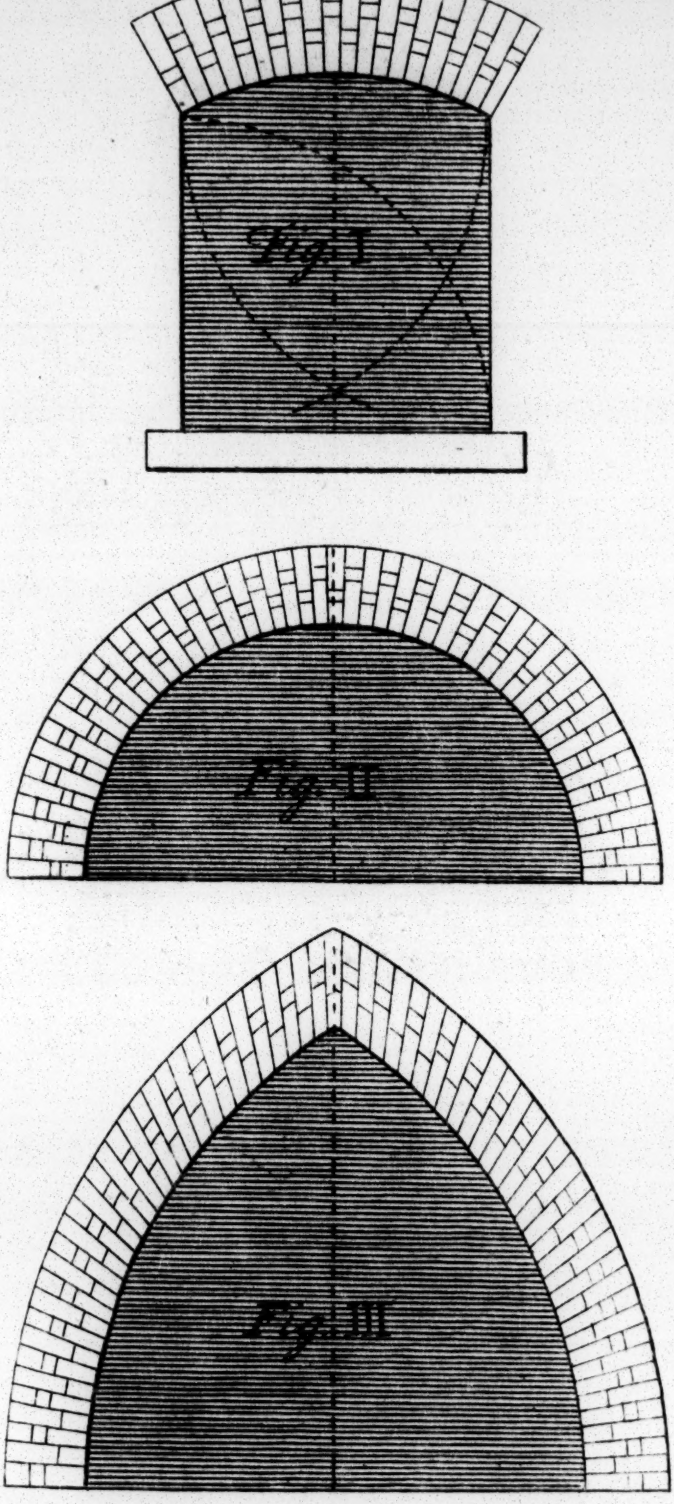
Pl. 22



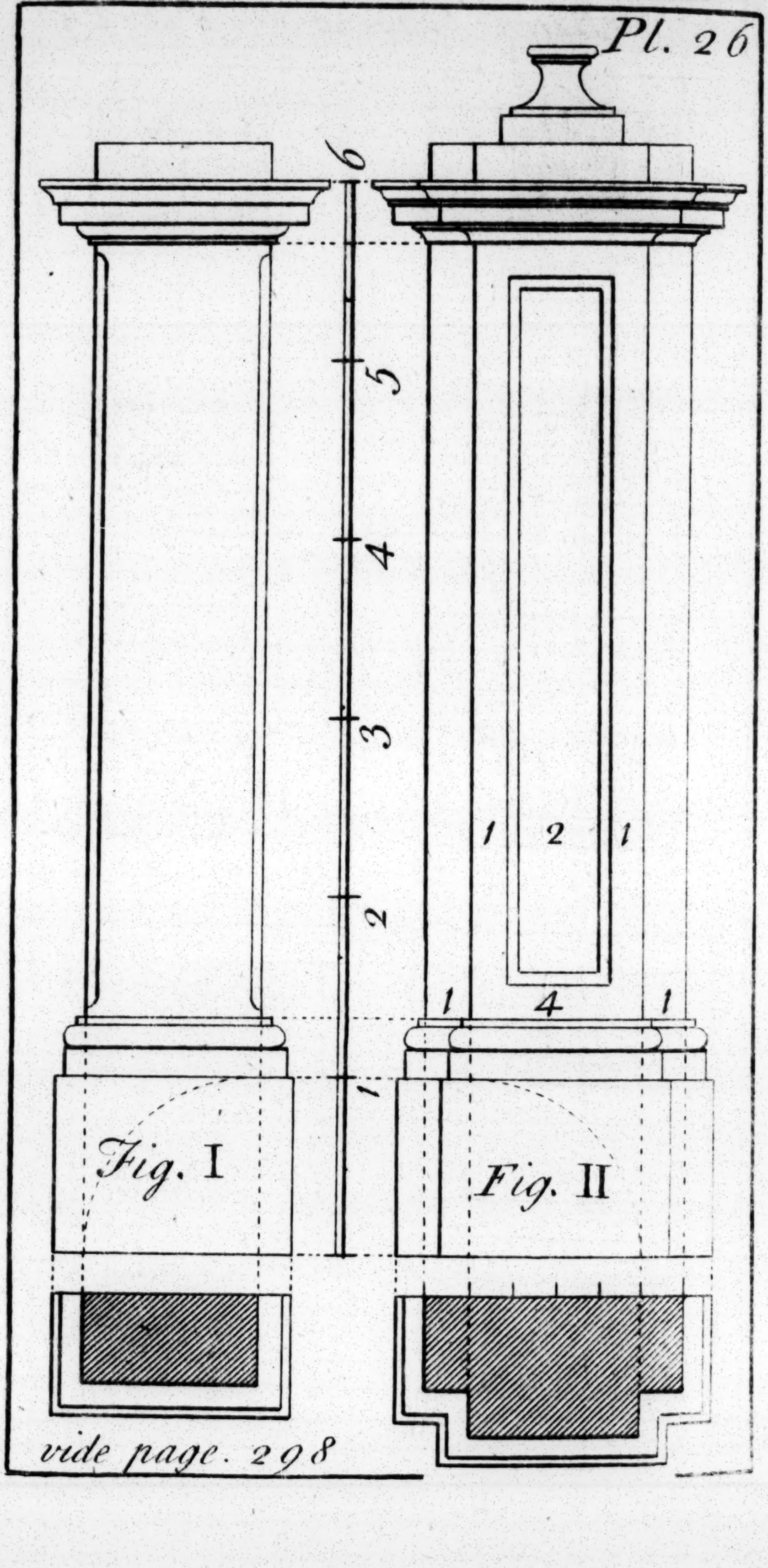



Pl. 23
Fig. I
p. 290
Fig. II
p. 290
Fig. III
Fig. IV

Pl. 24

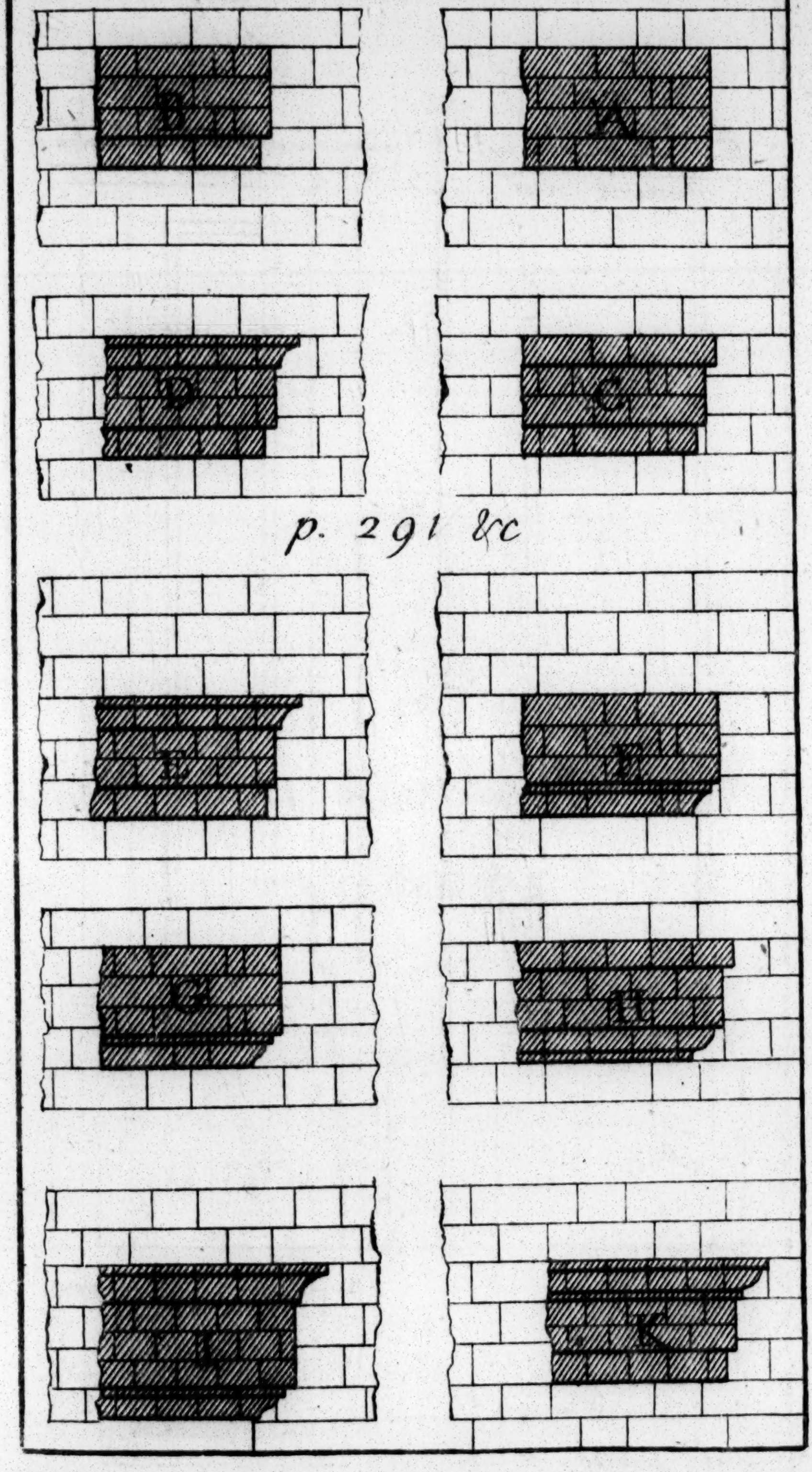


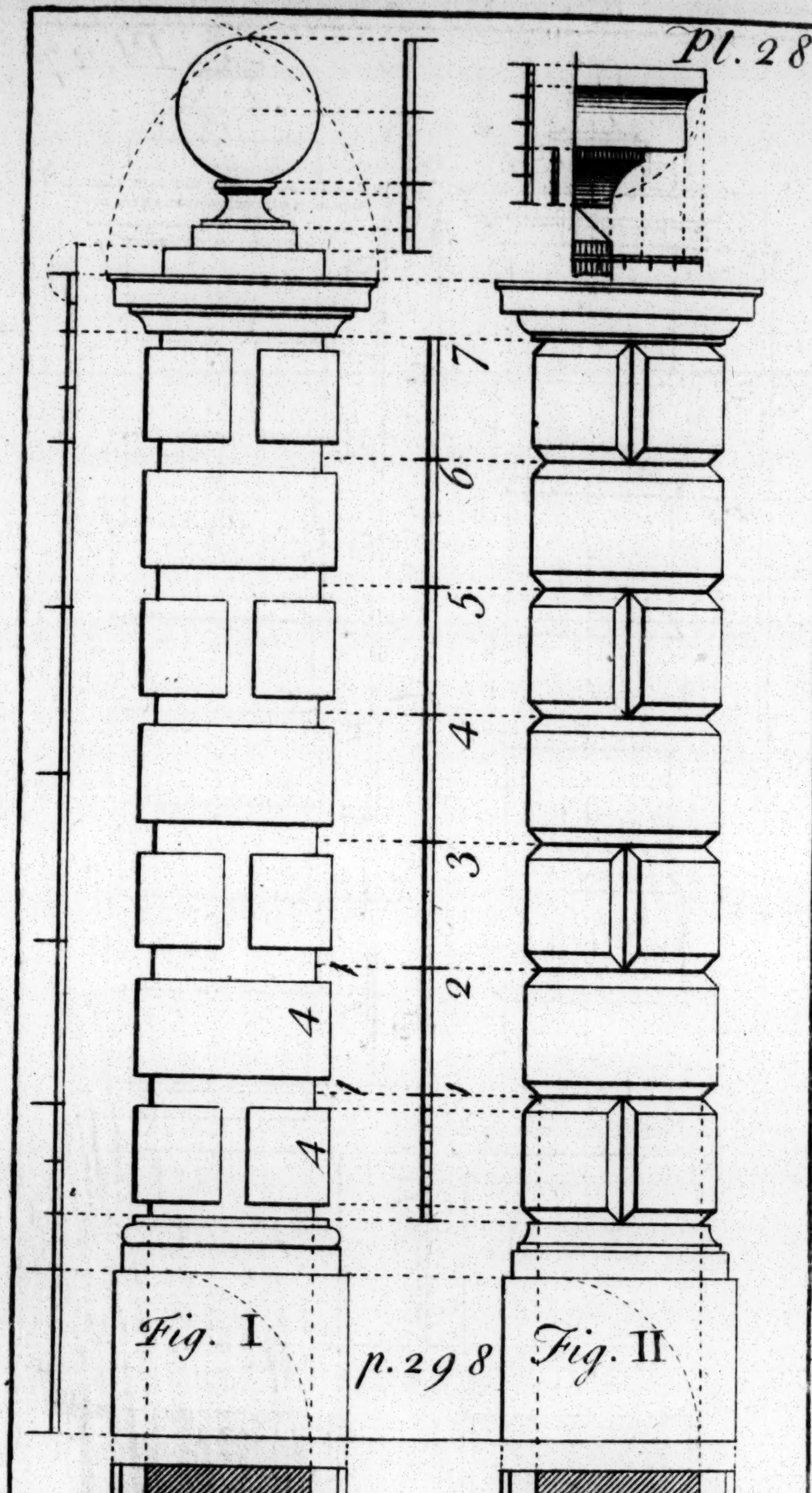
Pl. 26



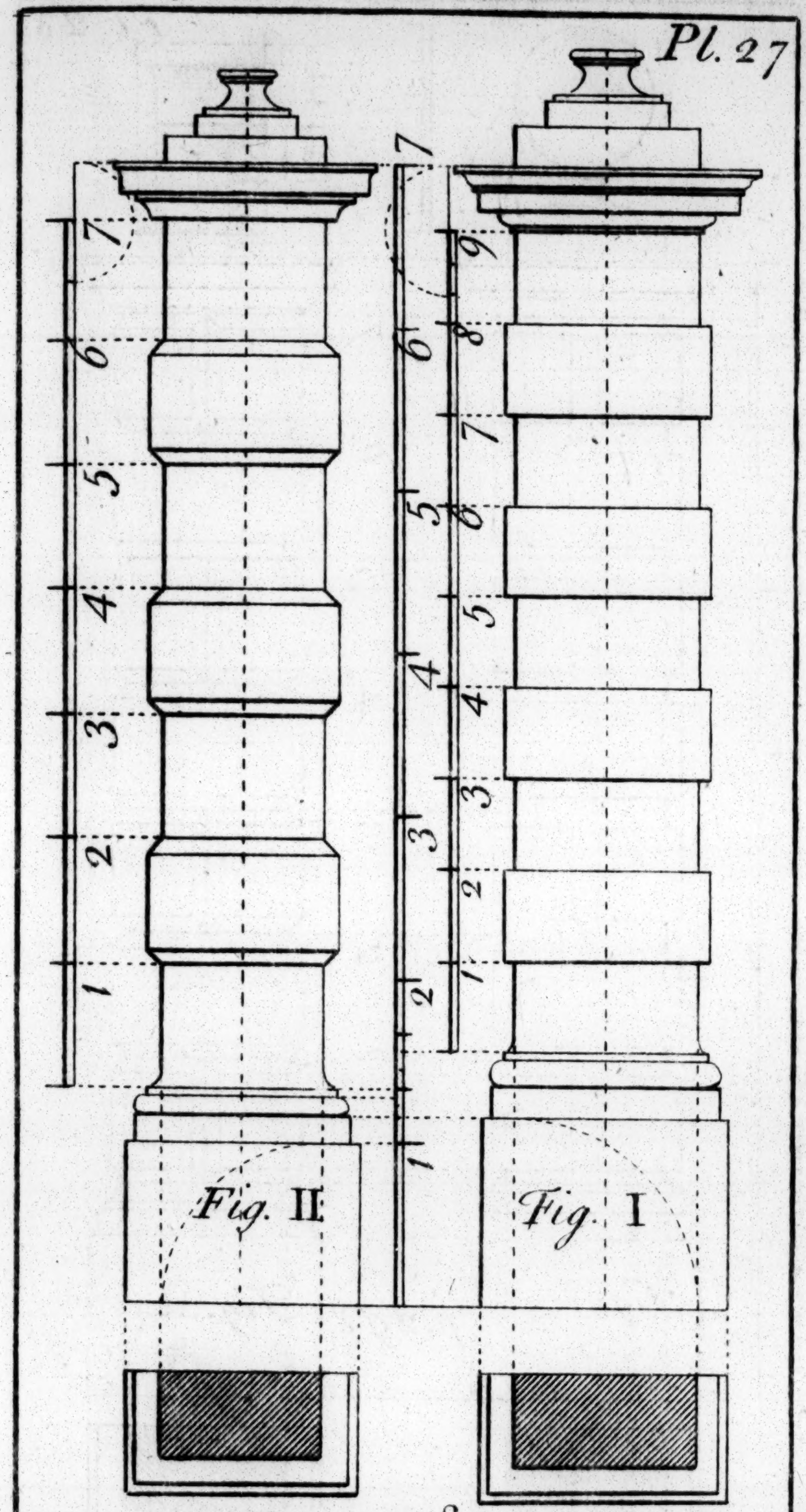
vide page. 298

Brick Fascia's *Pl. 25*

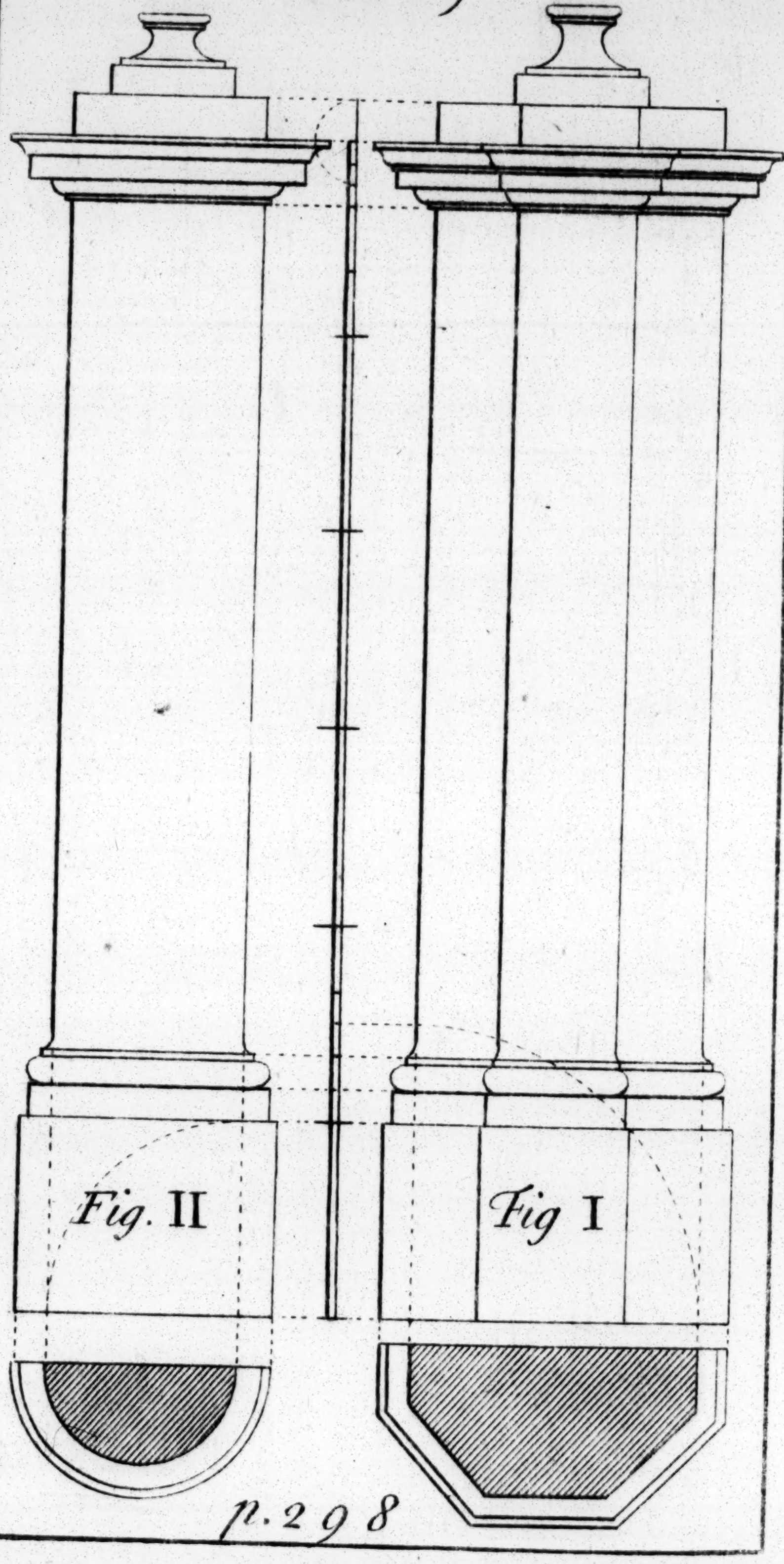



Pl. 28
7
6
5
4
3
2
1
4
4
Fig. I
p. 298
Fig. II

Pl. 27

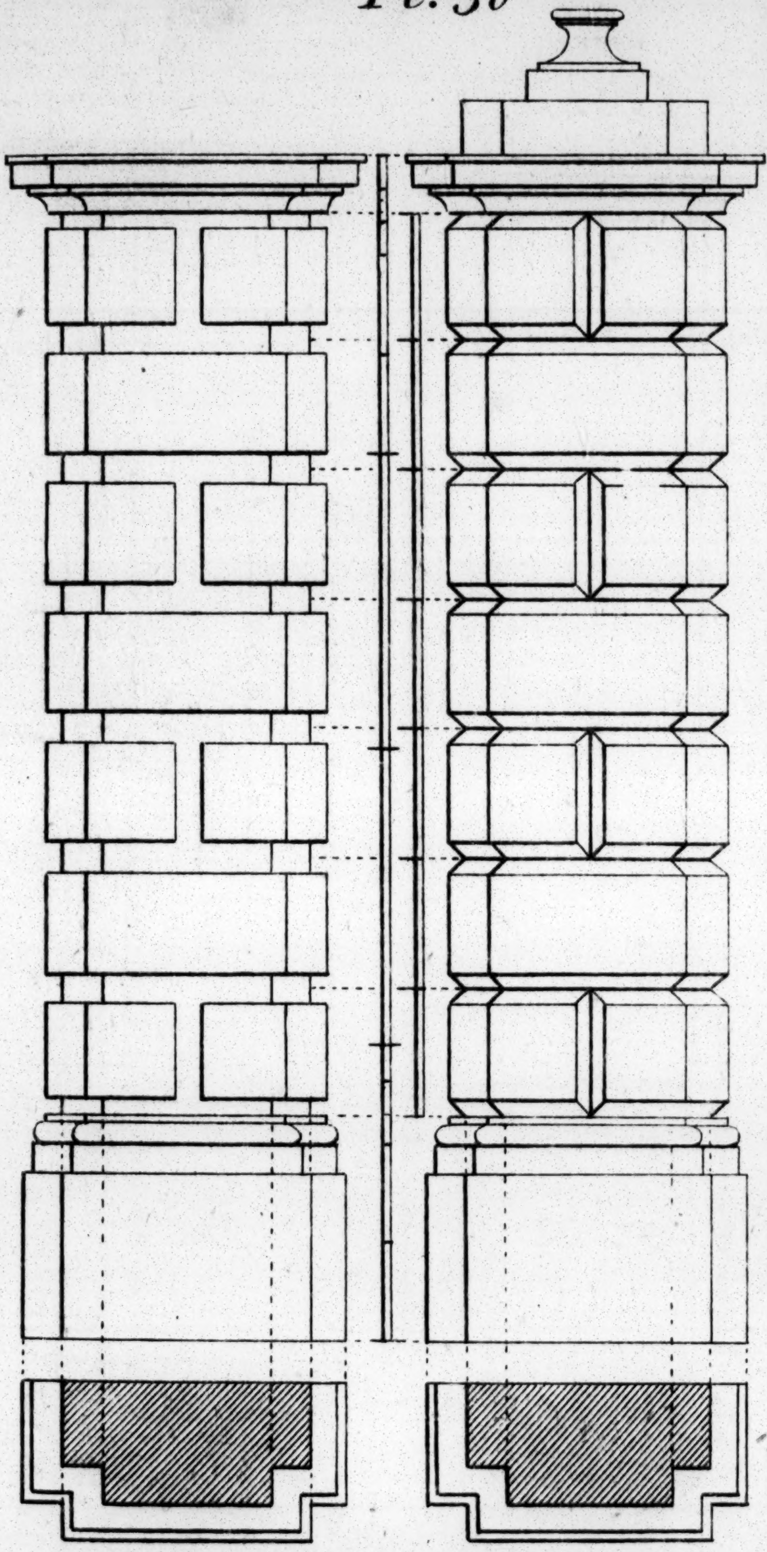


p. 298

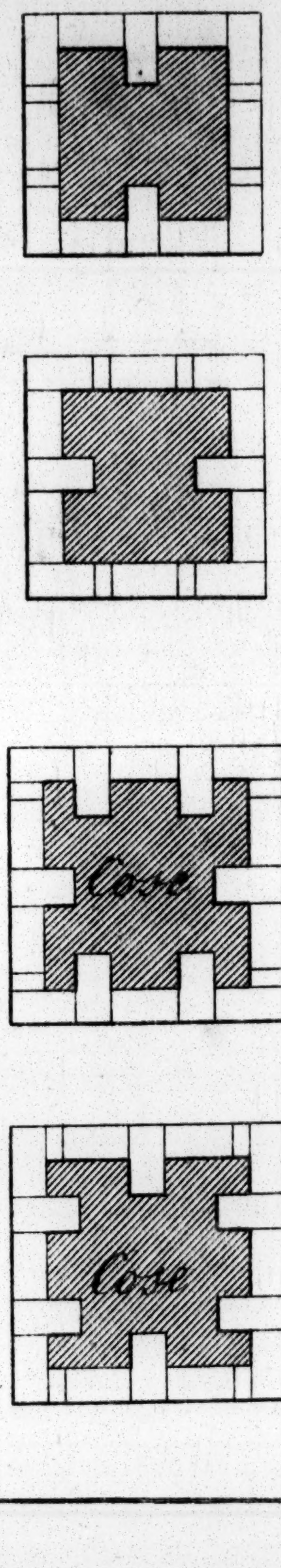


p. 298

Pl. 30



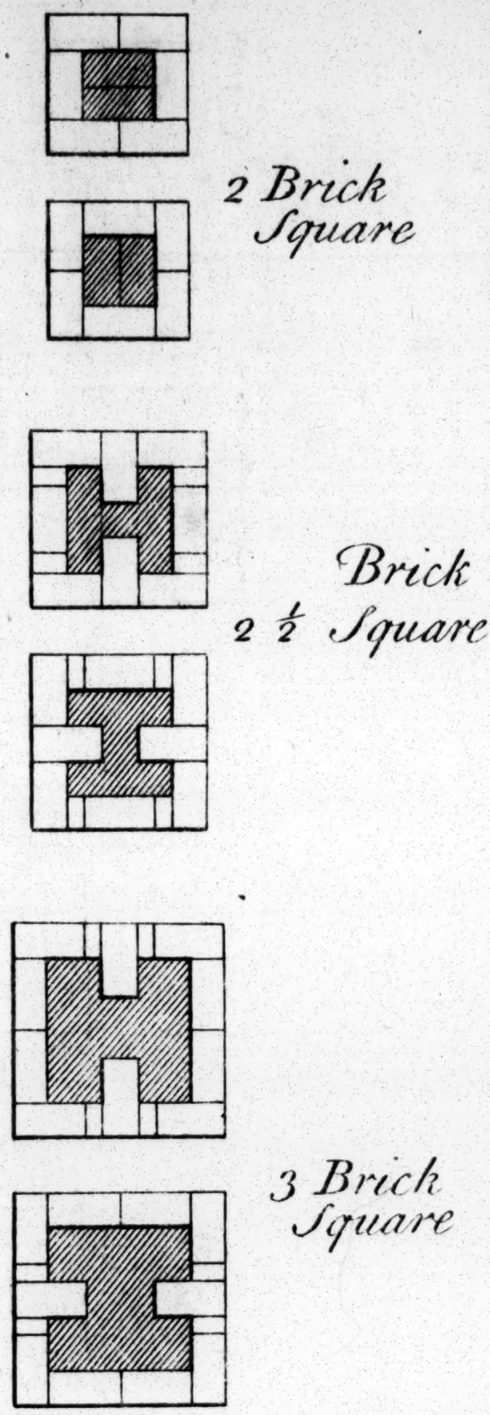
Plans for Brick Piers. Pl. 32



3½ Brick Square

4 Bricks Square

Plans for Brick Piers Pl. 31



367

AN INDEX OF The PRINCIPAL MATTERS contained in the preceding Work.

A.

Circular

D.

E.

in

F.

Note, *A Cube Foot of close trod Gravel, when filled loose without treading, will make 1 Cube Foot and 1 third of a Cube Foot.*
Therefore loose Gravel is to trod Gravel, as 4 is to 3.

And

And so a Cube Yard of loose Gravel is but three Fourths of a Cube Yard, when trod or settled in a Walk, &c. and 27 Cube Feet, firm in the Pit before being digged, will, when digged and filled into a Cart, be equal to 36 Cube Feet, which is but little more than 22 Bushels heaped.

H.

Hemi-

I.

Numb.

Lime

M.

Mortar

N.

O.

R.

Ruſticks

T.

T.

Tiling

W.

Walling

ERRATA.

PAge 34, Line 14, *for* heaped *read* ftriked.
Ditto, Line 26, *for* Sand Mortar *read* faid Mortar.

P. 85,	L. 1,	*for*	3	16	9		*read*	3	16	11
	8,	*for*	4	5	3	$\frac{1}{2}$	*read*	4	6	7
	10,	*for*	5	6	0	1	*read*	5	7	$2\frac{1}{2}$
	12,	*for*	5	6	0	1	*read*	5	8	0
	13,	*for*	0	12	8	3	*read*	0	13	$4\frac{1}{2}$
86	21,	*for*	0	6	0		*read*	0	7	$2\frac{1}{2}$
95	20,	*for*	6	10	6		*read*	3	1	$0\frac{1}{4}$
158	19,	*for*	2	14	6		*read*	3	5	$7\frac{3}{4}$
	20,	*for*	11	9	7		*read*	12	2	$8\frac{3}{4}$

Page 255	Line	6,	*for*	63	*read*	$31\frac{1}{2}$
256		21,	*for*	63	*read*	$31\frac{1}{2}$
		23,	*for*	637	*read*	$158\frac{5}{7}$
		27,	*for*	$31\frac{1}{2}$	*read*	$15\frac{5}{7}$
		28,	*for*	637	*read*	$158\frac{5}{7}$